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**A Revision of
The Genus *Poikilospermum* (Urticaceae) ***

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Summary

POIKILOSPERMUM is a genus of *Urticaceae* with twenty species segregated into two subgenera viz., subgen. *Poikilospermum* and subgen. *Ligulistigma*.

Morphologically, this genus is rather intermediate between the *Moraceae* and the *Urticaceae*: the vegetative structures are moraceous while the reproductive parts are urticaceous. Decision to regard this genus as one of *Urticaceae* is based mainly on the fact that ovules of all the species of *Poikilospermum* are orthotropous and basally fixed, a characteristic of the *Urticaceae*.

Species of subgenus *Poikilospermum* are mainly found in Eastern Malaysia whereas those of subgenus *Ligulistigma* are mainly Western Malaysian.

New name: subgenus *Ligulistigma* Chew.

New species: *P. inaequale* Chew (subgen. *Poikilospermum*). *P. tangaum* Chew (subgen. *Ligulistigma*).

New combinations: *P. naucleiflorum* (Roxb. apud Lindl.) Chew (subgen. *Ligulistigma*). *P. subtrinervium* (Miq.) Chew (subgen. *Ligulistigma*).

* This paper is based on part of a dissertation submitted by the author for the Degree of Doctor of Philosophy in Cambridge University, England in April 1960.

Introduction

Poikilospermum is a small and relatively unknown genus of the family *Urticaceae*. Merrill in 1934 accounted for thirty-six species. Of these, only twenty species are here distinguished. The special interest of this genus lies in the controversy over its systematic position.

Prior to 1894, this genus had been regarded as two segregate genera, namely: *Conocephalus* Bl. (1825) and *Poikilospermum* Zipp. ex Miq. (1864). While *Conocephalus* had been regarded as a genus of *Moraceae*, *Poikilospermum* had, on the other hand, always been taken for a member of the *Urticaceae*. In that year, 1894, Warburg considered these two congeneric, and as a consequence, he reduced *Poikilospermum* to a synonym since it was antedated by *Conocephalus*. (He, however, failed to realise that the epithet *Conocephalus* of Blume is a later homonym of Necker's *Conocephalus* which appertains to a group of Hepatics). In any event, his decision to bring the two genera together created a problem. Should the combined genus be *Moraceae* or *Urticaceae*? Warburg himself considered it a Moraceous genus and this was adhered to by Merrill in 1934. In that year, the latter rightly re-established the epithet *Poikilospermum* and relegated *Conocephalus* Bl. to a synonym. On the other hand, botanists like Winkler (1922) and Gagnepain (1929) maintained that it should belong to the *Urticaceae*.

This naturally led me to look into the delimitation of the two families concerned. I therefore worked systematically through (on a generic level) most of the collections of these two families (particularly the *Urticaceae*) in the herbaria of Kew, Cambridge and Singapore using the monumental works of Weddell, Baillon and others to check the characters of these families. The upshot of this subsidiary investigation is two-fold. Firstly, I came to the conclusion that *Poikilospermum* is an urticaceous genus that possesses some characters quite in accord with the *Moraceae* family. Secondly, I further conclude that there is only one distinguishing character between the *Moraceae* and the *Urticaceae*. In the *Urticaceae*, the ovules are always basal and orthotropous, whereas in the *Moraceae*, they are either laterally or apically fixed and are never orthotropous excepting the genera *Cecropia*, *Musanga* and *Coussapoa*. Since these three genera possess ovules quite similar to those of *Poikilospermum* and others of the *Urticaceae*, it is here considered necessary to transfer them together with *Poikilospermum* from the *Moraceae* to the *Urticaceae*. In this manner, the two families *Moraceae* and *Urticaceae* will be easily distinguished from each other at least on one character.

This revision is mainly based on herbarium materials supplemented by one year's field observation in the Malay Peninsula in 1956. Opportunity is here taken to express my gratitude to the Directors of the following herbaria for the loan of their materials as well as for their hospitality given me during my visits to their botanical institutions:—

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Last, but not least, I should like to thank my supervisor in the University of Cambridge, Mr. E. J. H. Corner, F.R.S., for whose continued interest and guidance, I am indeed greatly indebted.

Historical Review

From a nomenclatural point of view, the genus *Poikilospermum* is post-Linnean. From a botanical view point, however, a species of it had already been published in pre-Linnean literature. It was Rumpf who published a description and drawing of a species from Amboyna in 1750 which he named *Funis muraenarum latifolius*. The credit for the discovery of this pre-Linnaean trinomial goes to Merrill who, in 1917, equated it with *Poikilospermum amboinense*. I have studied Rumpf's publication of this species critically and could find no cause whatsoever to disagree with Merrill. As far as I have been able to trace, it seems to me that this is the only pre-Linnaean reference to the genus.

Poikilospermum is now a combination of three genera which had been regarded as separate. These are: *Conocephalus* Bl. (1825), *Poikilospermum* Zipp. ex Miq. (1864) and *Balansaeophytum* Drake (1896).

Blume founded *Conocephalus* in 1825 with only one species *suaveolens* which he based on a Javanese collection. He, however, did not realise that the generic name *Conocephalus* had already been given to a group of Hepaticae by Necker in 1790; in other words, he was using a later homonym.

Three years later in 1828, Lindley added another species to the genus, this time from India; and he named it *naucleiflorus*. He based this entirely on Roxburgh's description and drawing of *Urtica naucleiflora* which was still in the latter's manuscript. No more species were described between Lindley's publication and 1847.

In the latter year, Trecul published his "Memoire Sur La Famille Des Artocarpees". In this work, he reviewed Blume's genus and accounted for nine species namely: *suaveolens*, *lanceolatus*, *ovatus*, *roxburghii*, *pubescens*, *ellipticus*, *acuminatus*, *microphyllus* and *naucleiflorus*. He added seven species to the two already known. In a way, this work can be taken to be the first attempt at a revision of this genus. He was the first to have recorded the presence of *suaveolens* in the Philippine Islands, by correctly identifying a collection of it from Luzon. His *lanceolatus* and *roxburghii* were based on collections from India made by Griffith, and Wallich and Gaudichaud respectively. The species *ovatus* and *pubescens* were both founded by him on Javanese materials; while *acuminatus* and *microphyllus* were described from collections from the Philippines. According to him, the Malay Peninsula had only one species which he named *ellipticus*. As for *naucleiflorus*, he was unable to equate any collections with it thereby noting it as a "species mihi ignota". He commented that *suaveolens*, *lanceolatus* and *ovatus* are closely related and that later collections might contain intermediates that might prove them to be conspecific. With the other species, he made no comments.

Sometime between 1847 and 1848 Gaudichaud while publishing his drawings of plants he had come across on his world cruise on the "Bonite", added one more species to *Conocephalus* which he named *blumei* in honour of Blume. This species was based on his own collection from the Philippines. Miquel in 1851 also added one more species which he named *gratus* basing on a collection of Junghuhn from Java. By this year, the total number of species known of this genus had reached eleven.

In 1859, Miquel published his "Flora van Nederlandsch Indie"; and here he accounted for those species that occur in Malaysia. In this connection he enumerated four species: *suaveolens*, *microphyllus*, *ellipticus* and *acuminatus* ignoring the three species that had been described from India. He seemed to have overlooked the species *blumei* which should have been included since it had been described from the same part of Malaysia as *microphyllus* and *acuminatus*. Anyway, it was in this Flora that he regarded Trecul's *ovatus* and *pubescens* as being conspecific with *suaveolens*; and accordingly he made them varieties of the latter species; he even reduced his species *gratus* described only eight years previously. Two years later, in 1861, he published a supplement to this Flora and in it he added one more species named *subtrinervius* which he based on a collection of Korthals from Sumatra. He was therefore the first author to have recorded the genus from that land.

The year 1864 saw two publications relevant to this genus. One of these was the result of the joint effort of Teysmann and Binnendijk who added the second species of this genus to the Sumatran list. They named it *azureus*, basing it on a Sumatran specimen collected by Diepenhorst. The other publication, which is the more important one, was by Miquel who described a new monotypic genus called *Poikilospermum* noting it as a "Genus Novum Urticacearum". The type species, *amboinense*, was based entirely on Zippelius's manuscript. The authors of this new genus certainly had *Conocephalus* in their minds when they described it, for they noted that it is a "Frutex . . . habitu fere Conocephali". This statement certainly led numerous botanists at a much later date to look closely into the relationship of these two genera.

By 1864, most of the countries of Western Malaysia had already been noted as having at least one species of *Conocephalus*. Java was the first to be recorded (Blume 1825), followed by India (Lindley 1828), the Malay Peninsula and the Philippine Islands (Trecul 1847) and then Sumatra (Miquel 1861). The huge island of Borneo had not yet come into the list. It was not till 1867 that Miquel described two species from that island. He named them *borneensis* and *micranthus*; both were based on Korthals collections from South Borneo. It is of interest to note that with regard to *borneensis*, he contrasted it with *suaveolens*; and in the other species, he drew attention to the fact that *micranthus* is similar in habitat to *Poikilospermum* which had been published by himself three years previously.

In 1880, two botanists, F. Villar and A. Naves, published their "Novissima Appendix ad Florum Philippinarum Blanco" and it was here that the Philippine species of *Conocephalus* were revised since Trecul's work of 1847. They maintained that there were only four species in those islands: *suaveolens*, *microphyllus*, *acuminatus* and *erectus*. Their contribution towards the knowledge of this genus lay in their interpretation of two species described by Blanco in 1837 as *Procris violacea* and *Procris erecta*. *P. violacea* was considered by them conspecific with *suaveolens* and was consequently reduced to a synonym. With *P. erecta*, however, they were unable to equate it with any of the species known of *Conocephalus*. The upshot was that they recognised it as a distinct species of the genus and changed the epithet to *erectus* thus adding one more species.

The younger Hooker in 1888 revised the *Urticaceae* in his "Flora of British India". He took into consideration not only species that occur in India proper, but also those occurring in the Malay Peninsula. In all he enumerated five species: *suaveolens*, *amoenus*, *scortechinii*, *subtrinervius* and *concolor* as well as three species groups from which he refrained to give any specific epithet. Species *amoenus* and *scortechinii* were described by him from King's manuscript and were both based on materials collected from the Malay Peninsula. Regarding the species *suaveolens*, he not only upheld Miquel's decision in considering it to include the species *ovatus*, *pubescens* and *gratus*, but also extended it to cover the two Indian species *naucleiflorus* and *roxburghii*. Practically all botanists working on this group followed his decision. It has now been revealed that the Indian species in question are distinct from *suaveolens* and that their status should be re-established. The fourth species *subtrinervius*, which had been described from Sumatra, was wrongly interpreted by him. A few collections from the Malay Peninsula made by Griffith, Maingay, Scortechini, Kunstler and Lobb were equated by him with Miquel's *subtrinervius*. This has now been found to be erroneous: he was actually handling specimens of a species that had not yet been described. (See notes on *P. microstachys*). The species *concolor*, described by Dalzell from India, was relegated by him to a species in doubt.

With regard to the three species groups which he described but to which he applied no names, I have been able to identify only the third group, which was typified by a collection of Wray from Perak in the Malay Peninsula. This collection has now been found to belong to the species *suaveolens*. With the remaining two species groups, I have not been able to locate the specimens he cited; neither could I interpret the very general and short descriptions he supplied.

It has been mentioned earlier that Miquel, when publishing Zippelius's *Poikilospermum* in 1864, noted the similarity between Zippelius's genus and Blume's *Conocephalus*. In 1894, Warburg

took a decision on this, considered the two genera congeneric and formally joined them together. He naturally relegated Zippelius's *Poikilospermum* to a synonym of Blume's *Conocephalus* since the former was antedated by the latter; and combined *P. amboinense* to *C. amboinensis*. He apparently had still not realised the fact that the generic name *Conocephalus* of Blume which he upheld is actually a later homonym of Necker's *Conocephalus*. In any event, his main contribution lay in his decision in regarding these two genera congeneric.

The first attempt to solve this nomenclatural problem was made in 1898. In that year, a certain O. Kuntze, realising that Blume's generic name is not valid, proposed the name *Conocephalopsis* to replace it. He made no combinations under this name; neither was he taken notice of except by Merrill in 1934.

Wright in 1899, described a species from Yunnan in China. He named it *sinensis* basing it on a collection by Henry. With this publication, the 19th century history of this genus came to a close.

Early in the present century, a second attempt was made to revise the genus. It was a certain Italian named Bargagli-Petrucci who published his "Rivista del genere *Conocephalus* Bl." in 1902. Apart from the species *sinensis* of Wright which he overlooked, he accounted for all the species known at his time namely: *ellipticus*, *micranthus*, *suaveolens*, *borneensis*, *amoenus*, *acuminatus*, *microphyllus*, *scortechinii*, *subtrinervius*, *lanceolatus*, *amboinensis*, *azureus*, *blumei*, *concolor* and *erectus*. He lengthened this list by describing eight more new species: six from the island of Borneo, one from Sumatra and one from Papua in New Guinea. These new species were based entirely on collections made by Beccari from Malaysia.

Taken generally, Bargagli-Petrucci's contribution to a better understanding of this genus is to be found in the introductory part of his revision. Here he maintained that generally Blume's *Conocephalus* could be regarded as congeneric with Miquel's *Poikilospermum*; but added that these two genera deserve to be placed in separate sections within the genus. He clearly enumerated the characters that could be used to separate these two on an infrageneric basis. The result was the establishment of three groups within *Conocephalus* thus:

A. *Diandroconocephalus*.

"Stamens 2; perianth 2-fid, . . . rarely 4-fid." species: *ellipticus*, *micranthus*, *intermedius* etc.

B. *Euconocephalus*.

"Stamens 4; perianth 4-fid; persistent perianth enclosing fruit." species: *suaveolens*.

C. *Poikilospermum*.

“Stamens 4; persistent perianth forming a cup at the base of fruits; stigma sessile, discoidal, symmetrical.” species: *amboinensis* and *papuanus*.

He may not have clearly delimited the first from the second group, but he certainly fared very well in distinguishing *Poikilospermum*, the third group.

Between the years 1905 and 1921, eleven species were added to those so far recognised. One of these was re-established after it had been reduced to a synonym; another was a type species of a genus which was destined to become the third one to be considered congeneric with Blume's genus; while the rest, nine species, were new creations by various botanists.

The monotypic genus named *Balansaephytum* was founded by Drake in 1896 on a collection of Balansa from Indo-China. The type species was named *tonkinense*. It was not till 1907 that Renner, while working on the “. . . Anatomie und Systematik der Artocarpeen und Conocephaleen . . .”, discovered that *Balansaephytum* is congeneric with *Conocephalus*. He therefore combined the type species to *C. tonkinensis*. Incidentally, Renner was the first man to have investigated the anatomy of this genus.

The year 1922 witnessed the first publication of the *Conocephalus* Flora of New Guinea by a German named Winkler. It is very surprising that in this work he still retained the generic name *Conocephalus* despite the fact that he knew it to be a later homonym. He enumerated five species for that vast island, four of which were of his own creation, namely: *hirsutus*, *subscaber*, *paxianus* and *gjellerupii*; and the other species is of course Zippelius's *amboinensis*. He was aware of the work of Bargagli-Petrucci, but he overlooked the one species published by Ridley in 1916, i.e. *nobilis*. The status of Zippelius's and Blume's genera were discussed by Winkler in great detail; and he arrived at the conclusion that (a) the species *acuminatus* described by Trecul in 1847 from the Philippines is exactly intermediate between *Poikilospermum* and *Conocephalus*; and (b) that these two genera should be retained in their entirety as subgenera within the genus *Conocephalus*. In this respect, he differed from Bargagli-Petrucci who, twenty-years earlier, had divided the genus into three infrageneric groups. The two subgenera were named by him *Euconocephalus* and *Poikilospermum*. He placed all the New Guinea species under subgenus *Poikilospermum* and the rest in the other subgenus excepting the species *acuminatus*, the intermediate one, which he did not indicate to which subgenus it should belong.

Regarding his delimitation of the species, it has been revealed that of the four new species he described, only one is good, namely *paxianus*. His *hirsutus*, *subscaber* and *gjellerupii* are found

to be none other than variations of *amboinensis*. This is mainly due to the fact that he based his species on hairs of the plants, which characters happen to be quite untrustworthy as far as this genus is concerned. His specific descriptions are no doubt very detailed, but he used wrong characters in their delimitation.

In the following year, 1923 to be precise, Merrill published "An Enumeration of Philippine Flowering Plants". Like all former botanists, he upheld the generic name *Conocephalus*. Nine species were enumerated by him from the Philippine Islands, namely: *acuminatus*, *diffusus* (with two varieties), *erectus*, *grandis*, *grandifolius*, *mollis*, *piperi*, *suaveolens* and *warburghii*. This work is truly an enumeration, for he supplied neither specific descriptions nor keys. He merely equated collections with specific epithets!

Following this Enumeration, came Ridley's "Flora of the Malay Peninsula" in 1924. This Peninsula was claimed by him to have four species: *amoenus*, *suaveolens*, *scortechinii* and *subtrinervius*.

His treatment of the species *suaveolens* and *scortechinii* was good. Into the former species, he correctly reduced part of King's *amoenus*. It has now been revealed that the whole of King's species *amoenus* should be reduced to *suaveolens* as well. Further, he considered Trecul's *ellipticus* as conspecific with *suaveolens* which is very true. With *scortechinii*, he rightly equated numerous collections from the Malay Peninsula.

Nevertheless, he made mistakes too. In the first place, he wrongly equated a few collections with *amoenus*. His own collections from Langat, Selangor and those of Yapp from Gunong Inas in Malacca are notable examples. These collections are actually the Malayan counterparts of the Bornean species *cordifolius* founded by Bargagli-Petrucci. The other mistake was his presumption that the interpretation of *subtrinervius* by Hooker was correct.

The year 1929 saw the first account of this genus from Indo-China. Gagnepain described four species in Lecomte's "Flore Generale de l'Indo-Chine" in that year, namely: *suaveolens*, *tonkinensis*, *annamensis* and *mollis*, the last two being his new species. He did not seem to be aware of the fact that the epithet *mollis* had already been used by Merrill in 1921 for a species in the Philippine Islands. The species *suaveolens* was set apart by him from the other three because, according to him, the female perianth of it is free at the apical half whereas in the others, the greater part of the female perianth is gamophyllous. This character has now been found to be extremely variable. Very many collections of this species from the Malay Peninsula have female perianths which are free only a third of its length.

The species *tonkinensis* and *mollis* are now reduced to *suaveolens*. Only his *annamensis* is a distinct species.

So far, only one botanist had undertaken to reject Blume's generic epithet *Conocephalus* from this genus. It was Kuntze who in 1898, as mentioned earlier, proposed a new name *Conocephalopsis* to replace it; but he made no combinations under this name.

It was not till 1934 that a final decision was taken on this. In that year, Merrill published his "Plants Collected in Sumatra . . ." in the "Contributions from the Arnold Arboretum"; and in it, he rejected Blume's *Conocephalus* in favour of Zippelius's *Poikilospermum* which is the earliest name available for this genus. The name *Poikilospermum* which had been relegated by Warburg in 1894 to a synonym has at last been rightly re-established. Merrill then proceeded to make new combinations of all the species so far described and which he recognised as distinct. In all, he made thirty-six new combinations in this genus which will henceforth be known as *Poikilospermum*. It was noted by him that there are other names available for it, namely: *Balansaephytum* Drake (1896) and *Conocephalopsis* Kuntze (1898), but that these are all antedated by Zippelius's name.

General Morphology

Morphologically, the genus *Poikilospermum* is very interesting. It belongs to the family *Urticaceae* and yet possesses characters that are commonly associated with the *Moraceae*. Vegetatively it is moraceous while reproductively, it is more urticaceous. It is therefore hardly surprising that few botanists can find common grounds on the systematic position of this genus.

Apart from some adventitious roots developed by many species, these plants do not possess any specialized organs for climbing. It is doubtful if these roots do in fact help the plants to "climb" at all. Many field botanists have recorded plants of this genus as "epiphytes", "woody epiphytes", "woody climbers" or "scrambling shrubs". Strictly speaking, these plants are no more epiphytic than, for example, the Grape Vine. Neither can these plants be termed "climbers" in the strict sense. In my opinion, the term "woody scrambler" will circumscribe the habit of them fairly well as will be explained presently.

It seems quite clear to me that these plants probably start life as true epiphytes. The achenes are small and are probably carried by birds to the angles of branches of trees. These achenes then germinate, and as the seedlings grow, roots are sent downwards to the soil. Once root systems are established in the soil, the plants begin to branch profusely, horizontally as well as vertically. The branches then begin to "scramble" from branch to branch of the host tree and usually extend to neighbouring trees as well; and in this process, one plant may cover a surprisingly large area. It is therefore not surprising that a collector, when confronted by one of these end twigs, should note it an "epiphyte". Should

the collector on the other hand come across the main plant, he would probably record it a "climber." Hence, the term "woody scrambler" is preferred in this paper.

Incidentally, this habit of growth is certainly very reminiscent of that exhibited by the popular strangling figs except that no trees have yet been recorded as having been strangled by any species of *Poikilospermum*.

Vegetative Organs

Twigs. The twigs, especially the leafy part, offer fairly good taxonomic characters. Their sizes may vary very considerably even within a species, but certain species do have a maximum size to which they would normally attain. Species like *microstachys* and *scortechinii* usually have very slim twigs. On the other hand, species like *cordifolium* have very thick ones. The appearance of the periderm of the twig is even more valuable as a taxonomic character (fig. 1). Species of subgenus *Poikilospermum** usually have periderm that may be deeply ridged, but never split; whereas in subgenus *Ligulistigma*, many species have periderm splitting into small copper-brown flakes (as in *suaveolens*) or into large white-greyish sheets (as in *cordifolium*).

Leaves. The leaves of the plants of this genus as a whole are fairly uniform. These are typically dorsi-ventral, petiolate, simple, entire, generally coriaceous and spirally arranged. Delimitation of the two subgenera on the basis of the leaves is quite impossible; in fact, it is sometimes extremely difficult even to decide from leaves whether a specimen is *Poikilospermum* or not! Nevertheless, within each of the subgenera, certain species can roughly be identified by their lamina form. For instance, *microstachys* usually has long oblanceolate lamina with acuminate apex and very cuneate strongly tri-nerved base. The species *nobile* (subgenus *Poikilospermum*) has enormous obovate lamina which may reach a length of seventy centimetres with more than eighteen pairs of lateral veins. Then there is the species *peltatum* (subgen. *Ligulistigma*) which is the only one in the whole genus to have peltate laminas.

Petioles. These, for the genus as a whole, are usually canalized on the upper surface and they range from two to as much as thirty centimetres in length. They may be very thin, as in *lanceolatum* and *microstachys* or extremely thick and fleshy as in *cordifolium* and *suaveolens*. It is difficult to distinguish subgenus *Poikilospermum* from subgenus *Ligulistigma* on the basis of the petioles. Within the latter subgenus, however, the species tend to segregate into two groups depending on the appearance of the periderm of the petioles. In the first group, e.g. *lanceolatum*, *microstachys* and *scortechinii*, the periderm of the petioles seem

* In this work, two subgenera are recognised for the genus *Poikilospermum* as had been done by Winkler in 1922.

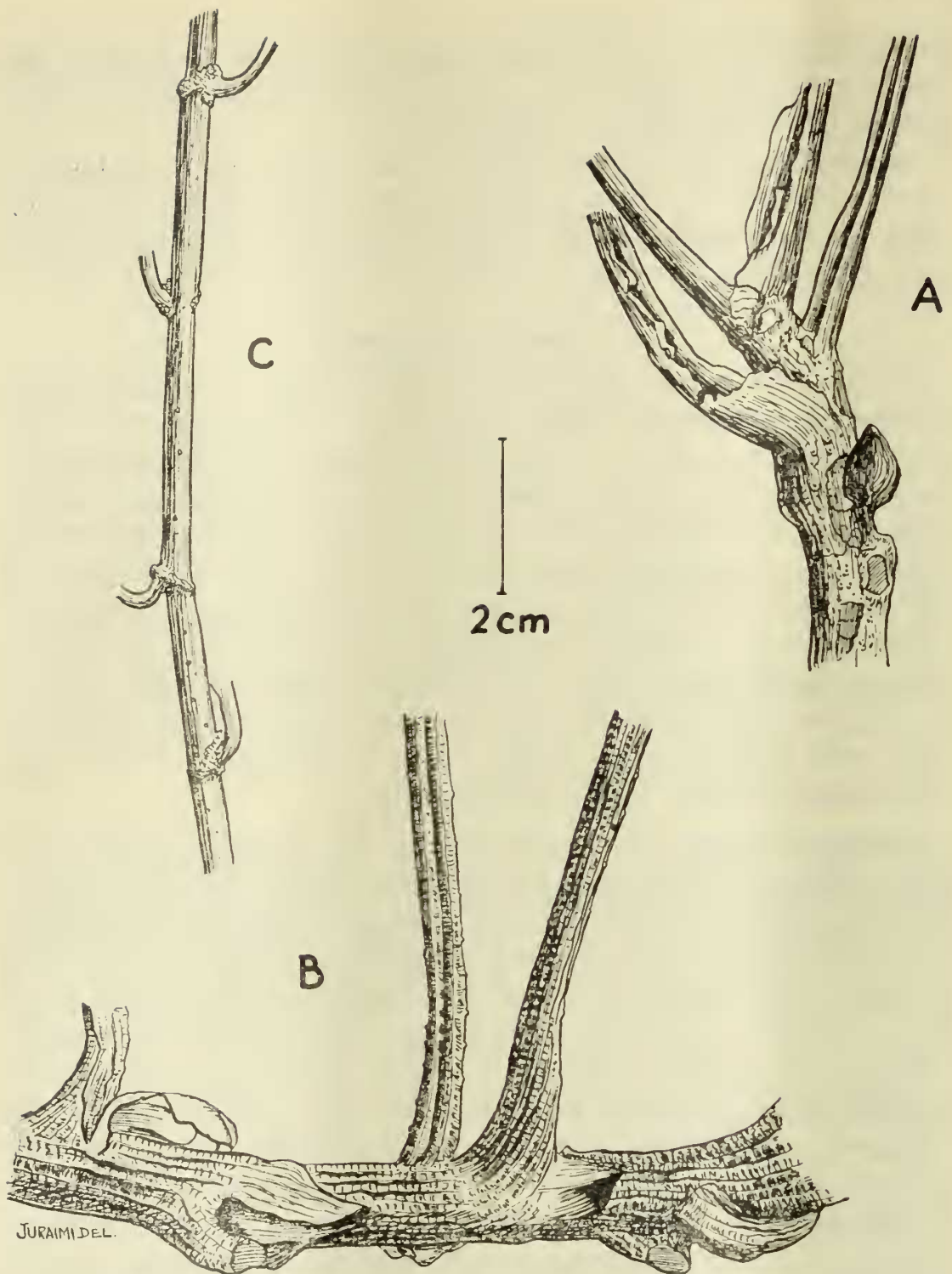


Fig. 1. Periderm of twigs. A, periderm splitting in sheets (*P. cordifolium*). B, periderm splitting in flakes (*P. suaveolens*). C, periderm not splitting (*P. scortechinii*).

to be smooth and not splitting at all. In the other group, as in the species *suaveolens*, *naucleiflorum*, *azureum* and a few others, the periderm usually split into small copper-brown flakes similar to those found on their twigs. These flakes may vary in size and profusion. For example, specimens of *suaveolens* from Continental Asia and the Philippines tend to have petioles with very profuse and large flakes, where as those from Java tend to have small and fewer flakes. Such flaky petioles have so far not been observed in any of the species of subgenus *Poikilospermum*.

Stipules. These are connate and intrapetiolar without exceptions. Their shapes, texture and persistence are often useful for identifying sterile materials. Firstly, it can be generalized that all

the species of subgenus *Ligulistigma* have arched to strongly crescentic stipules. In subgenus *Poikilospermum*, only one species has arched stipules; all the other four species have very long and straight ones. Then there is the texture of the stipules. In the species *microstachys*, these tend to be fairly chartaceous compared with many of the other species which have very coriaceous or even woody ones. Again, in the species *tangaum*, these can be so chartaceous that they curl up into scale-like structures (fig. 2). Lastly the persistence of the stipules. In the species

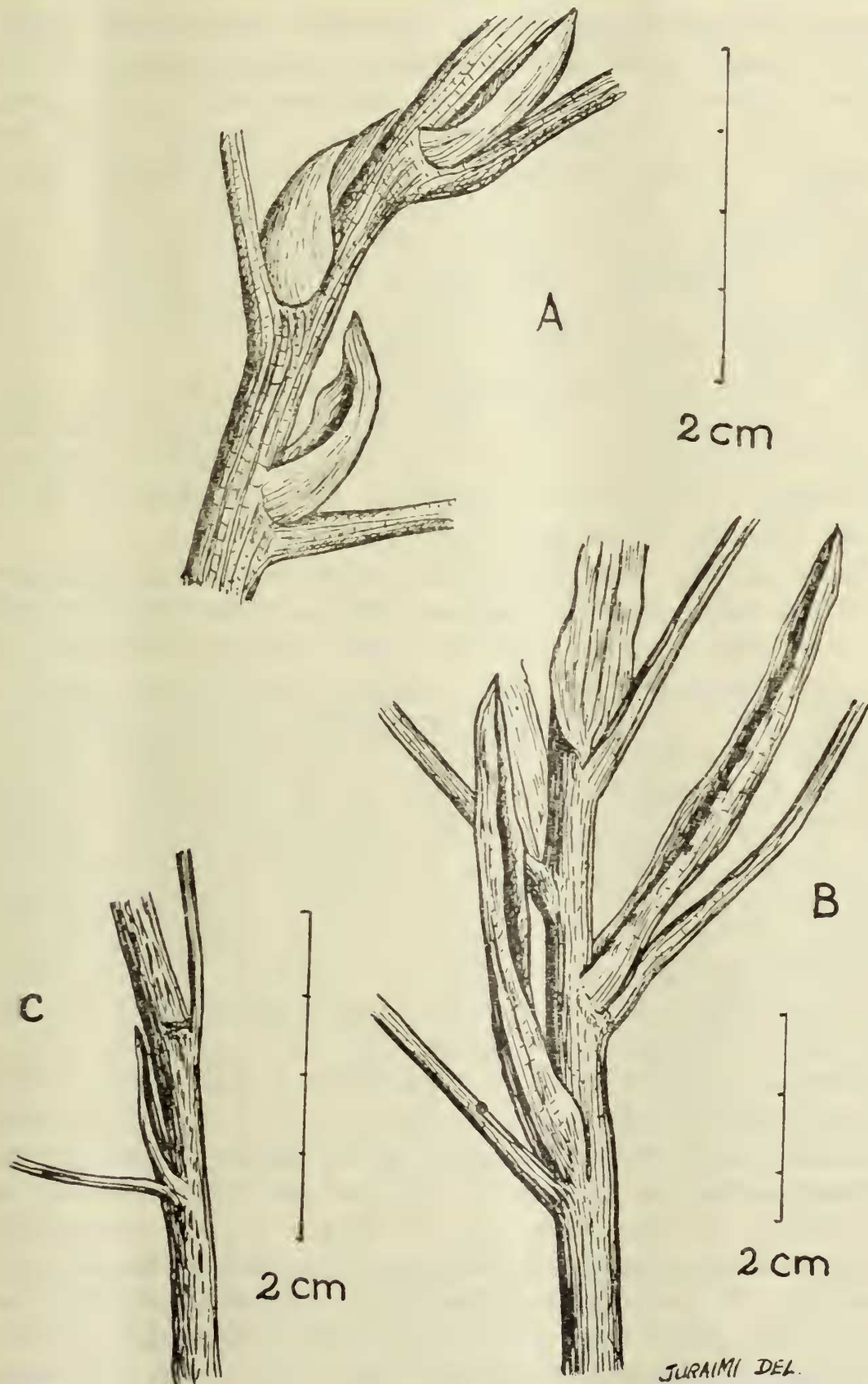


Fig. 2. Stipules. A, crescentic type. B, long and straight type. C, small chartaceous type.

suaveolens, *microstachys* and *acuminatum*, the stipules are generally persistent; and when they eventually fall, they do not normally leave very prominent scars on the twigs. On the other hand, species like *scortechinii* are noted for the caducousness of the stipules which always leave very prominently raised stipular scars.

Microscopical Structures of the Lamina

Jarrett, in her dissertation submitted in 1956 for her doctorate degree in Cambridge University (published subsequently in the Journ. Arnold Arbor. in 1959) indicated that the anatomy of the lamina is useful in many ways in the taxonomy of the genus *Artocarpus* as well as its allied genera of the *Moraceae*. She found that valuable taxonomic characters can be obtained from a detailed study of glandular hairs as well as the spongy mesophyll. DeWolf, in 1958, also in his dissertation for the same degree at Cambridge, found that as far as the American Figs are concerned, the lamina offer good taxonomic characters in their stomata, indument and cystoliths.

The lamina of *Poikilospermum* were investigated in the same way. To my surprise I found that all the species are very uniform in their microscopic structures of their lamina. Before revealing the results of the present investigation, the work done by others on the anatomy of this genus will be reviewed.

Renner in 1907 was probably the earliest botanist to investigate these structures of *Poikilospermum*. Three species were studied by him: *suaveolens*, *lanceolatum* and *tonkinense*. In fact, he actually investigated only two species, *suaveolens* and *naucleiflorum*. Due to his erroneous identification, *lanceolatum* (sensu Renner) was actually *naucleiflorum*; while his *tonkinense* is now held to be conspecific with *suaveolens*. In any event, he could not indicate whether any specific characters could be obtained from lamina anatomy. All he did amounts to a contribution towards the knowledge of lamina anatomy of the genus as evident from a study of these two species. He found that the epidermis of the lamina is three to four layers in thickness. The hypodermis has much bigger cells than those of the epidermis and that the innermost ones have mucilaginous walls. The stomata are of the cruciferous type and totally confined to the abaxial surface. Hairs are claimed by him to be one-celled, with or without lumen. Cystoliths occur on both surfaces of the lamina. Those on the adaxial surface are spread all over and are either elongate or punctiform; whereas those of the abaxial surface are mainly confined to the veins and intercostals. He also found that the cystoliths of the adaxial surface often extend deeply into the hypodermis except those on the veins. The hydathodes are very numerous on the adaxial surface and each has thirty to forty water pores.

In 1950, Metcalfe and Chalk in their joint work on the "Anatomy of Dicotyledons" confirmed Renner's results regarding the microscopic structures of the lamina of this genus. They further found that glands with unicellular stalks are present in groups of two to five and that the lower epidermis seems to be similar in a few species of *Poikilospermum* and *Ficus*!

In the present investigation, transverse sections and epidermal peels were made from lamina of random samples of many species.

Hairs. These seem to be unicellular, with or without lumen. They are non-glandular. Such hairs are totally absent from *scortechinii* and a few others. In *suaveolens*, *acuminatum* and *amboinense*, they may be present or absent. On the other hand, species like *erectum* and *paxianum* have very dense hairs which may be very long. In these species the hairs tend to be concentrated on the abaxial surfaces, very few being on the other side. As far as glandular hairs are concerned, it is found that not many species have these structures. Even in those species that do have such hairs, it is found that not all plants possess them. They always have unicellular stalks with one to many-celled heads. The hairs, whether glandular or not, have now been found to be of no taxonomic value whatsoever by themselves. They can be of use to a limited extent if taken in conjunction with many other characters. Winkler in 1922 tried to use hairs in the delimitation of the New Guinea species with the result that his species turned out to be "bad".

Cystoliths. These are present on both surfaces of the lamina. In shape, they mainly appear elongate, very rarely punctiform. On the adaxial surface, they occur all over and are arranged pointing towards hydathodes (fig. 3). On the abaxial surface, however, these cystoliths are found along the mid-rib, the lateral veins, intercostals and veinlets, and are arranged with their long axes parallel to these veins if they are elongate in shape. These whitish coloured cystoliths represent greatly enlarged epidermal cells each containing a large crystal. The crystals may be elongate or round depending on whether the cystoliths, in which they are found, are elongate or punctiform. If a good transverse section of the lamina is made, a few cystoliths may be seen deeply penetrated in the inner tissue of the upper surface of the lamina. Such a phenomenon has not been observed on the lower part of the lamina.

In connection with the cystoliths, it has been found that practically all the species of subgenus *Ligulistigma* have the elongate type of cystoliths whereas in subgenus *Poikilospermum* some species have the elongate type and others the other type. This character, however, cannot be used to delimit any species within

subgenus *Poikilospermum* for the simple reason that there are a few plants which have cystoliths that are intermediate in shape between elongate and punctiform.

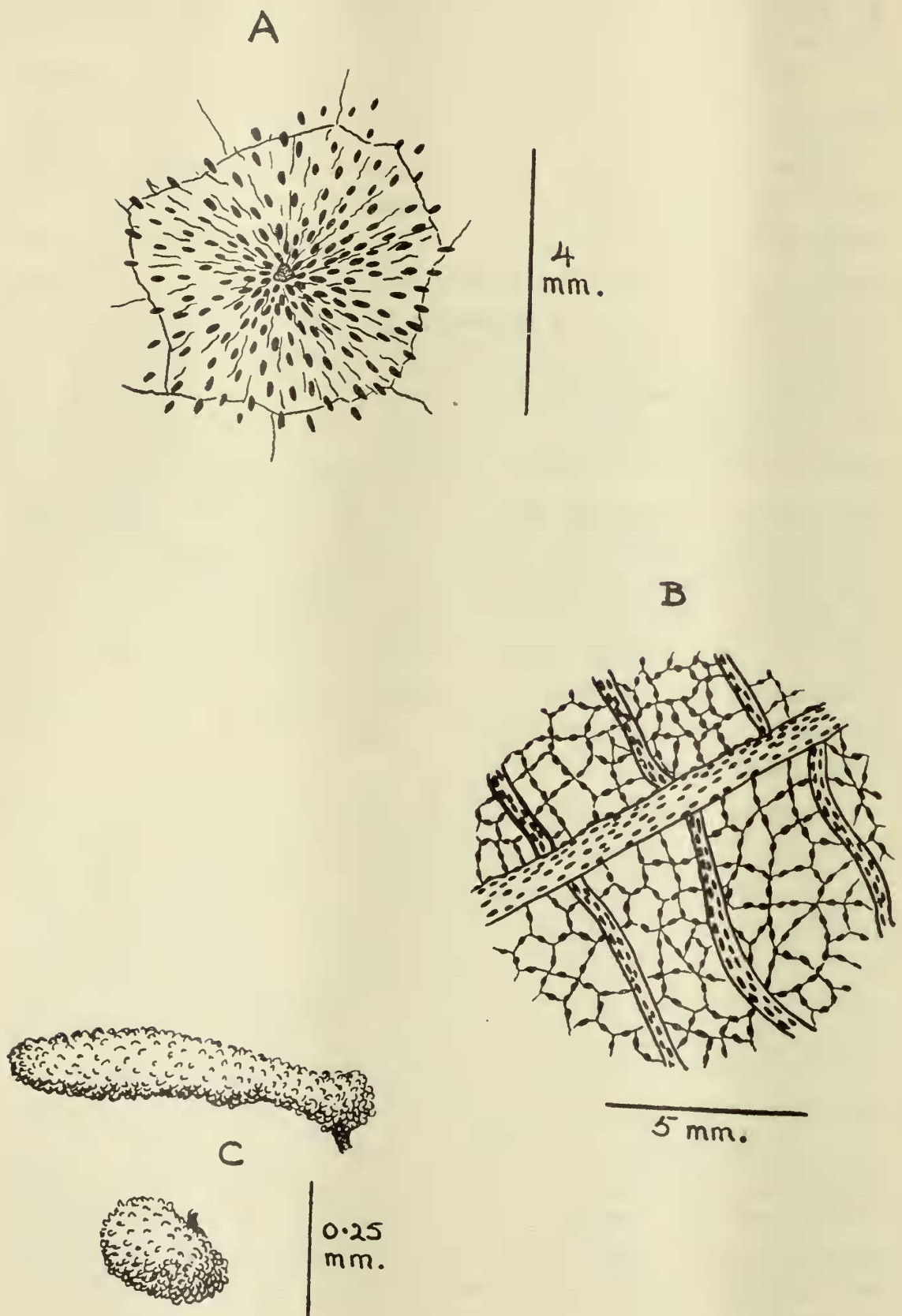


Fig. 3. Cystoliths. A, around a hydathode on adaxial surface of lamina. B, on veins of abaxial surface. C, elongated and round crystals.

Stomata. It has been found that almost without exception, the stomata are all concentrated on the abaxial surface of the lamina and tend to be congregated in the spaces between the veins. They are all superficial, i.e. not sunken into pits and are generally of the so-called cruciferous type i.e. surrounded by a set of three subsidiary cells one of which is usually smaller than the others. However, in a few collections of *suaveolens*, stomata with four subsidiary cells have been found on the same lamina as those with three subsidiary cells (fig. 4). All in all, it can be safely stated

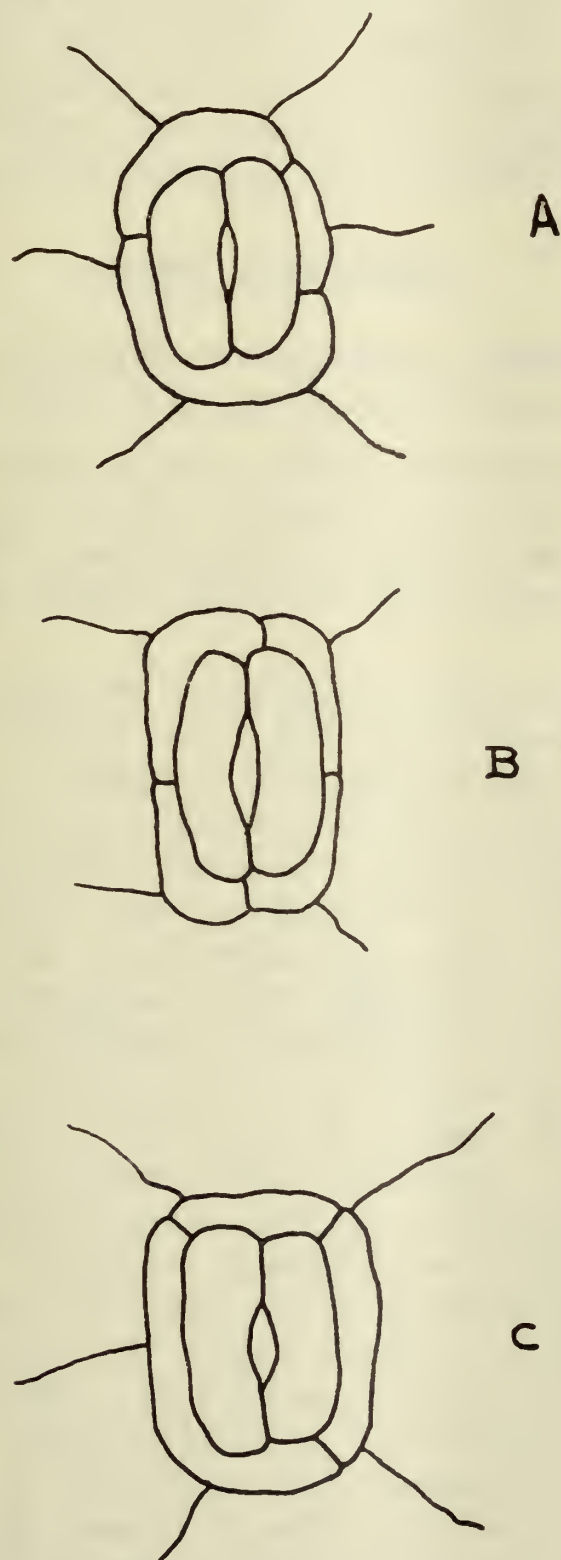


Fig. 4. Stomata. A, stoma with 3 subsidiary cells, the smallest one at the side. B, stoma with 4 subsidiary cells. C, stoma with 3 subsidiary cells, the smallest at one end of stoma.

that stomata structure is not useful for either the infrageneric or the specific delimitation of *Poikilospermum*.

From the foregoing, one can visualize how moraceous these plants appear vegetatively. In the first place, the leaves are definitely moraceous. The very coriaceous, entire and smooth-edged laminae are more like those of some Figs than those of for example, *Urtica* or *Fleurya*. In fact during the course of this research, many sterile duplicates of fertile collections of *Poikilospermum* have been encountered bearing determination labels written "Ficus sp.?" As far as the stomata are concerned, the cruciferous type seems to be a common characteristic of both *Urticaceae* and *Moraceae*.

The stipules of this genus, which are mainly connate and intrapetiolar, are certainly more in accord with those of the *Moraceae*. The species *amboinense*, for instance, has stipules which are very similar indeed to those of some species of *Artocarpus*.

Reproductive Organs

As to be expected, the reproductive structure offer most of the taxonomic characters of this genus and its taxa.

Inflorescences. These are found to be of prime importance for the recognition of the two subgenera. They are all axillary, unisexual, cymose and are almost always solitary. The peduncles are bracteate, the bracts being invariably paired and decussate in arrangement.

The species of subgenus *Ligulistigma* are characterised by their "capitulate" inflorescences, that is, the flowers are borne very crowded upon swollen peduncular receptacles. In subgenus *Poikilospermum*, on the other hand, the flowers are not so borne, but are in groups which are here conveniently termed "agglomerations" (fig. 5). (It must be mentioned here that the term "capitulate" as applied in this work to the inflorescences of subgenus *Ligulistigma* in no way implies that these plants possess true capitula as those of the *Compositae*: rather it simply means "head-like".) Such capitula may be small as in *lanceolatum* or very large as in *suaveolens*. These capitula are not found in species of subgenus *Poikilospermum*, as mentioned earlier, excepting one species, *acuminatum*. In this species, which is in many respects rather intermediate between the two subgenera, the flowers are borne upon extremely minute swellings of the peduncular receptacles that it is impossible for one to decide whether this species should belong to one subgenus or the other on the basis of this character alone; and it is only with the aid of floral characters that it is now held to belong to subgenus *Poikilospermum*.

In addition to this major difference between the two subgenera, there is the question of the presence or absence of solitary terminal flowers at the axils of the ultimate dichotomies of the inflorescences. In subgenus *Poikilospermum*, practically all the male inflorescences

have such flowers, whereas in the other subgenus, these flowers are totally absent. In the female plants, however, the subgenus *Poikilospermum* suffers an exception in the intermediate species *acuminatum*. This is the only species in this subgenus which does not have solitary terminal flowers in its female inflorescences whereas in the others, they are always present.

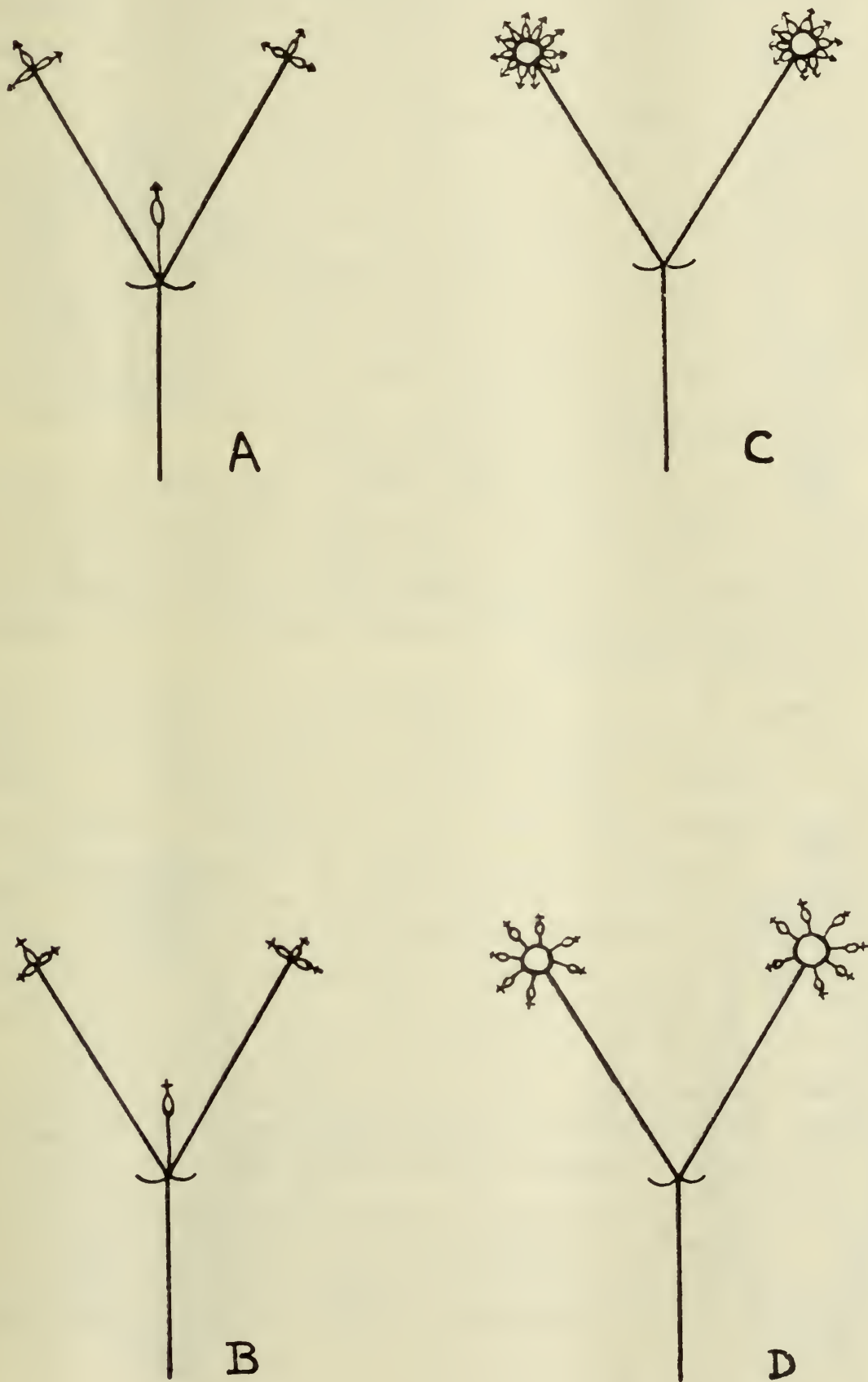


Fig. 5. Diagrams of inflorescences. A and B, male and female typical of subgen. *Poikilospermum*. C and D, male and female typical of subgen. *Ligulistigma*.

On the specific level, the inflorescences also prove to be useful. It has already been mentioned earlier that the inflorescences are mostly solitary with the exception of two species. These two species are *microstachys* (subgen. *Ligulistigma*) and *inaequale* (subgen. *Poikilospermum*). They may have solitary, paired to numerous inflorescences at each leaf axil. They are thus quite clearly distinguished from the species of their respective subgenera. The extent to which the inflorescences are branched is another good taxonomic character as far as the subgenus *Ligulistigma* is concerned. Species like *suaveolens*, *cordifolium*, *annamense* and a few others constantly have the female inflorescences branching only once, at most twice to produce usually two, very rarely four very large capitula. Species like *scortechinii*, on the other hand, have greatly ramified female inflorescences with eight or more capitula in each inflorescence. In the male inflorescences of species like *suaveolens*, *annamense* and *cordifolium*, the peduncles of the third branching order are so short that the male capitula become arranged into two umbel-like groups. Such male inflorescences are not found in species like *scortechinii*, *peltatum*, *erectum* and a few others in which the inflorescences are greatly ramified.

The nature of the peduncular bracts is also used to a certain extent for species delimitation. These may be extremely large and foliaceous as in *suaveolens* or they may be extremely minute as in *lanceolatum*. In *scortechinii* the bracts are early caducous and usually leave very prominently raised bract-scars on the primary and secondary peduncles.

Flowers. The value of the inflorescences as taxonomic characters is greatly enhanced if these are taken in conjunction with floral characters. Typically, the flowers of the genus as a whole are unisexual and very small. The male flowers are usually four-tepalled with usually an equal number of stamens surrounding a pistillode in the centre. The female flowers are gamophyllous, with four-lobed or -toothed perianths; and each has an ovary terminated by a simple almost sessile stigma. Rudiments of the stamens are not found in the female flowers. Unlike *Artocarpus*, the perianths of these flowers never fuse with each other in the inflorescence.

Male Flowers. With the exception of the species *paxianum* (subgen. *Poikilospermum*) all male flowers are sessile. The nature of the filaments of stamens is quite different in the two subgenera. In subgenus *Poikilospermum*, the filaments are commonly inflexed in the bud whereas in subgenus *Ligulistigma*, they are always erect. Apart from this, the male flowers are quite uniform for the genus as a whole; and are therefore not of much use in the delimitation of the species.

Female Flowers. The female flowers of subgenus *Poikilospermum* are different from those of subgenus *Ligulistigma*. In the former subgenus, the flowers are mainly sessile, excepting the species

paxianum. The perianths are gamophyllous with four-toothed apices and the stigmas are subsessile and are always capitate and brush-like. In the latter subgenus, all the species have pedicellate flowers the perianths of which are also gamophyllous, but with four-lobed apices. The stigma are subsessile alright but they are always longish ligulate. On these characters, one can easily separate the two subgenera (fig. 6). The ovaries are, on the other hand, exceedingly

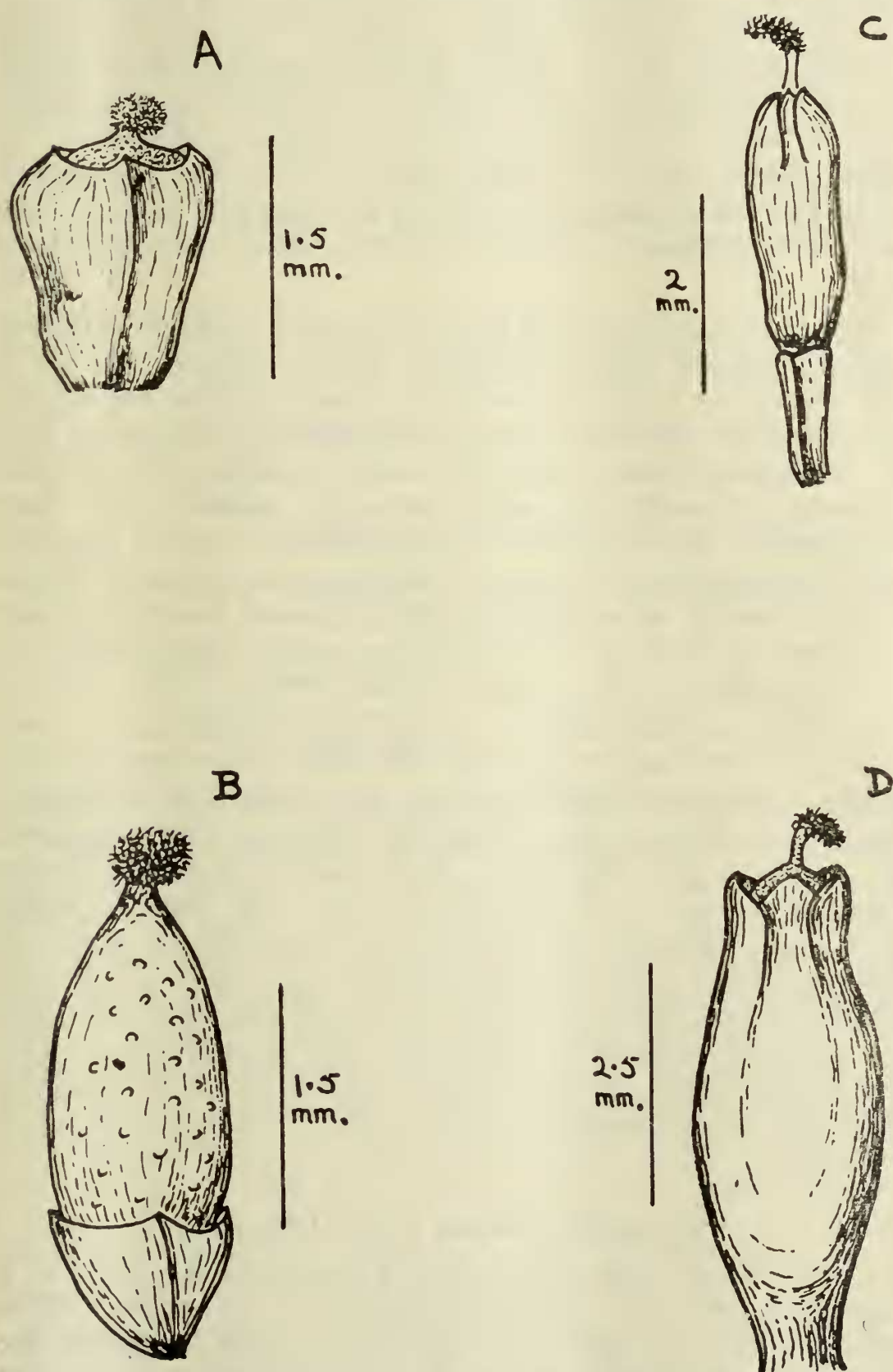


Fig. 6. Flowers and Achenes. A and B, flower and achene typical of subgen. *Poikilospermum*. C and D, flower and achene typical of subgen. *Ligulistigma*.

similar in the two subgenera. They are typically flat ovoid, one-carpelled, one-loculed and each containing a single ovule which is always basal and orthotropous.

Achenes. These are generally small and ovoid; and in length, they may vary from two to four millimetres. Their absolute lengths are of very little taxonomic value; but when compared with the lengths of the perianths, which usually persist, they certainly provide one of the most diagnostic characters of the two subgenera. In subgenus *Poikilospermum*, the achenes at maturity are usually exerted a long way out of the persistent perianths which usually form cups at their bases. In *Ligulistigma*, however, the achenes are almost always totally enclosed by the persistent perianths (fig. 6). Each achene contains a straight embryo of about two millimetres in length. The cotyledons are oblong in shape and are about one and a half millimetres long. The radicle is about half a millimetre long.

The ejection of the achene from the perianth is rather interesting. Bargagli-Petrucci in 1902 observed that (as far as species of *Ligulistigma* are concerned) when the achene matures, the internal surface of the perianth becomes mucilaginous, gets detached from the underlying tissues and then becomes inflated. This inflation naturally pushes the ripe achene out of the perianth cover ready for dispersal. He added that this phenomenon has not been observed in the species of subgenus *Poikilospermum* probably because in these plants the achenes are already so exerted from the perianth that they are ready for dispersal. This peculiar phenomenon has also been observed by Corner in Java (1959).

In the reproductive organs, not only urticaceous but also moraceous characters are encountered. The fleshy inflorescences of the species of subgenus *Ligulistigma* are very reminiscent of those of *Artocarpus*. However, those of the other subgenus *Poikilospermum* are definitely very urticaceous. Then there is the male flower. Those of the species of *Ligulistigma* have erect filaments which again is a moraceous character; whereas those of the species of *Poikilospermum* have inflexed stamens which character is very common amongst the *Urticaceae*. As for the female flowers, these are mainly urticaceous in character. Their stigmas are not split like those of some species of *Ficus*. Besides, the ovary contains a basal and orthotropous ovule like those of all other species of *Urticaceae*.

Systematic Position in the Urticales

I have already mentioned in the Introduction that there is a controversy over the systematic position of this genus *Poikilospermum* and that this controversy led me to investigate the relationship and delimitation of the two families, *Moraceae* and *Urticaceae*. After much research, I now come to the conclusion that *Poikilospermum* belongs to the *Urticaceae* and that the cause

of this controversy lies in the delimitation of these two families. They are so very closely related to each other morphologically that it is quite difficult to draw a line between them. The only difference is that while the ovules of the plants of *Urticaceae* are always basal and orthotropous, those of the plants of *Moraceae* are either apically or laterally fixed and are never orthotropous. Most of the early workers on these families underestimated the importance of this character; and as a consequence a few genera that are rather intermediate in character between these two families have been erroneously placed, as the following short history of the classification of the Order *Urticales* will show.

The classification of the *Urticales* did not begin till 1789. In that year, De Jussieu established an "Ordo" which he named *Urticeae* to accommodate the Nettles and their allies then known. He divided the "Ordo" into three parts to which he applied no names, thus:

- I. "Flores in communi involucro monophyllo reconditi."
Genera: *Ficus*, *Dorstenia* and other alien genera.
- II. "Flores receptaculo communi multifloro impositi, aut squamis involucrantibus capitati, aut distincti sparsi."
Genera: *Cecropia*, *Artocarpus*, *Morus*, *Elatostema*, *Boehmeria*, *Procris*, *Urtica*, *Forskahlea*, *Parietaria*, *Humulus* and *Cannabis*, and other alien genera.
- III. "Genera Urticis Affinia."
Genera: *Coussapoa*, *Pourouma* and a few other alien genera.

In this context, De Jussieu took the *Urticeae* in its widest sense; so wide that many genera of other Orders had been included. The genera *Ulmus* and *Celtis* then known to him, were placed outside this "Ordo" and into the next one which he named. *Amentaceae*. Within the *Urticeae*, the genera *Coussapoa* and *Pourouma* were considered as affinities of the Nettles, a decision which is hard to interpret since the inflorescences of these two genera are rather similar to those of *Cecropia*. While the first part of the *Urticeae* in which he placed the genera *Ficus* and *Dorstenia* may in many respects be considered as fairly natural, the second part is certainly a large odd collection of *Urticales* which had been conveniently put together. He based his broad divisions of this "Ordo" mainly on the characters of the inflorescences without giving considerations to floral characters.

However imperfect his system may seem, De Jussieu still deserved credit, for he was the first botanist to bring the genera together into one group upon which the modern concept of *Urticales* is built.

A slight improvement in this system was put forward in the year 1806. Lamarck and DeCandolle in that year published their joint work of "Flora Gallica . . ."; and in it they improved Jussieu's treatment of the *Urticeae* by dividing the "Ordo" into two distinct tribes: *Artocarpeae* and *Urticeae* proper on the basis of the embryo structure. All the genera that have fleshy fruits, that have flowers borne on common receptacles and with curved embryos were put by them into the *Artocarpeae*; while the others that may even have curved embryos were taken as belonging to *Urticeae* proper. This work was certainly an improvement if only on the fact that the flowers and fruits were given more importance as taxonomic characters. Then in 1815, these same botanists in their "Flore Francaise" stated that the *Artocarpeae* and the *Urticeae* proper might one day become two distinct families.

It has been remarked earlier that the *Ulmus* and *Celtis* had been left by Jussieu in the *Amentaceae* as distinct from *Urticeae*. In 1815, a certain Mirbel formed a new family based on these two genera and named it *Ulmaceae*. He did not indicate whether this family was related to the *Urticeae* or not.

It was not till 1818 that Jussieu's "Ordo" of *Urticeae* began to be split. In that year, Brown raised Lamarck's and DeCandolle's *Artocarpeae* to the status of family. This system of Brown, however, was not widely followed by many botanists some of whom persistently adhered to that of Jussieu.

Blume for example, in 1825, while studying the plants of the Dutch Indies, put all the genera he knew of the *Urticales* into one family, the *Urticeae*, which he subdivided into four taxa namely: *Pholeosanthaeae*, *Artocarpeae*, *Coenosanthaeae* and *Cannabineae*. In the first taxon, *Pholeosanthaeae*, he placed the genera *Brongniartia* and *Ficus* i.e. those plants whose flowers are enclosed within receptacles. The second taxon *Artocarpeae* was taken to include those plants whose flowers are borne on fleshy receptacles such as *Artocarpus*. It was amongst these plants that he placed the genus *Conocephalus* Bl. (now the subgenus *Ligulistigma* of *Poikilospermum*). His third taxon, *Coenosanthaeae*, was a "Taxonomic dustbin" into which he placed the genera *Urtica*, *Procris*, *Morus* and even *Celtis* which Mirbel had already put into a new family earlier. The last taxon was specially created by him to cover the genus *Cannabis*.

In the following year, 1826, Gaudichaud presented his system of classifying the *Urticales*; and here he also ignored Brown's work. He not only adhered to the system of Jussieu, but also extended the *Urticaceae* to cover many piperaceous plants. The *Urticeae* was divided by him into five taxa which he stated could be taken either as tribes or subfamilies. Of these five, only the first three taxa need concern us since the other two are mainly

piperaceous. The first taxon was named by him *Urticeae proper* and as for the rest, he refrained from applying names. These taxa were distinguished by him thus:

1. *Urticeae* proper, with erect ovules, originally fixed by the second end, with . . . straight embryo.

Tribes: *Elatostemeae*, *Urereae*, *Boehmerieae*, *Partenarieae*, *Forskahleae* and *Cecropieae*.

2. *Urticeae* with laterally or apically fixed ovules, with curved embryos

Tribes: *Celtideae*, *Cannabineae*, *Broussonetieae*, *Moreae*, *Ficeae* and *Dorstenieae*.

3. *Urticeae* with laterally fixed ovules which are straight to variable: with fleshy recumbent embryos.

Tribes: *Pouroumeae* and *Artocarpeae*.

His main contribution to the taxonomy of this group is to be found in the way he demarcated the *Urticeae* proper from the rest of the Order, thus creating the rudiments of the modern concept of the *Urticaceae* (sensu stricto). He is the first botanist to recognise the importance of the ovule and it is gratifying to note that he included the *Cecropieae* amongst the Nettles. It is to be noted also that he put the *Artocarpeae* farther away from the Nettles.

Within each one of his subfamilies, he further sorted the genera into numerous tribes many of which still stand today. In many respects, therefore, Gaudichaud can be called the "Father of *Urticaceae* (sensu stricto)".

On the other hand, a few botanists like Lindley and Endlicher believed in the splitting up of the old family of *Urticeae*. The former botanist, in 1830, recognised three families, the *Ulmaceae* as created by Mirbel, the *Artocarpeae* by Brown and the *Urticeae* proper. The main characteristics of the *Urticeae* proper were claimed by him to be: "Apetalous dicots with definite erect ovules: . . . and an embryo with the radicle remote from the hilum." In short, the *Urticeae* proper has plants with straight embryos.

In the year 1833, Endlicher changed the family name of *Urticeae* to *Urticaceae* which is the one in vogue today. Four years later, this same botanist published his "Genera Plantarum" and in it he split Jussieu's family into more parts than any of his predecessors had done. He not only upheld the families of Brown and Mirbel, that is *Ulmaceae* and *Artocarpeae*, but also considered the *Celtideae*, the *Moreae* and the *Cannabineae* as also deserving family recognition. Six families were thus recognised by him: *Urticaceae*, *Ulmaceae*, *Artocarpeae*, *Celtideae*, *Moreae* and *Cannabineae*. The families *Ulmaceae* and *Celtideae* were regarded by him as two very closely related ones. Similarly, he held the same view regarding the *Moreae*, *Artocarpeae*

and *Urticaceae*. He further stated that the creation of the family *Artocarpeae* would leave the *Moreae* better defined. In other words, he in a way recognised the heterogenous nature of the *Artocarpeae*: and this is quite true as the description he gave for it will clearly testify: "*Artocarpeae*: Flowers unisexual, . . . on flat or convex receptacles . . . ovules orthotropous, basal, or amphitropous, parietal, . . . rarely apical anatropous." This system was quite closely followed by many later botanists such as Brongniart (1843) and again Lindley (1846) with only few modifications.

Lindley, it will be recalled, recognised only three families in 1830. In 1846, he changed his mind and in his "Vegetable Kingdom" he enumerated five families: *Urticaceae*, *Cannabinaceae*, *Moraceae*, *Artocarpaceae* and *Ulmaceae*. He placed the *Celtis* and *Ulmus* back to one family which he removed to a different Order entirely, thus differing from Endlicher in one way. Modern terminations were given by him to all the names of these families. In connection with the *Urticaceae*, he remarked, "Their great distinction consists in their having a single erect ovule in a simple carpel, . . . Nettleworts will then be easily known from the Morads and the Hempworts which have a hooked embryo, . . ." With the *Cannabinaceae*, he had this to say: "These plants, formerly regarded as a division of Nettleworts, differ from that Order in having their seeds suspended, their embryos coiled . . . To the *Artocarpads*, they approach in technical characters, differing chiefly in their embryos; but they have no milky juice, and are widely different in appearance. From the Morads, they are hardly distinguishable . . ." His remark on the family *Artocarpaceae* is very interesting: "The massive heads into which the fruits of the Breadfruit trees are collected represent the typical condition of the genera of this Order . . . The *Artocarpads* will be distinguished from the Hempworts and the Morads by their straight embryos with their large cotyledons . . . From the Nettleworts the difference is rather one of habit than of real structure, as far as our information at present goes. Brown, indeed, who first proposed the Order, stated that the ovule was erect, which however, is not the case in either *Artocarpus* or *Maclura* . . . Perhaps the large convolute stipules may form a further characteristic of *Artocarpads*."

This clearly shows that Lindley realised very well the lack of distinguishable characters in the *Artocarpaceae*. It is very surprising that, on the one hand, he delimited *Urticaceae* from the rest on the basis of the ovules mainly; and on the other hand, he allowed this very important structure to be superseded in taxonomic value by the so-called fleshy inflorescence in the *Artocarpaceae*.

In the following year, 1847 to be precise, Trecul revised this very troublesome family *Artocarpaceae*. (He used the older name

Artocarpeae.) This family was divided by him into six tribes: *Conocephaleae*, *Pouroumeae*, *Euartocarpeae*, *Olmedieae*, *Ficeae* and *Brosimeae* whose tribal characters he very clearly laid out in a synoptic chart.

The tribe *Conocephaleae*, evidently based on Blume's *Conocephalus*, was set by him apart from the rest of the *Artocarpaceae* on the basis of the ovules which are basal and orthotropous. The second tribe, *Pouroumeae*, which contains only one genus, *Pourouma*, was distinguished by him from the others on its semi-anatropous and laterally fixed ovules. All the other tribes were put closer to each other because their ovules are apically fixed. Thus he clearly contrasted the *Conocephaleae* against all the others of the *Artocarpaceae*.

He did not leave the matter as such. He went on to compare the *Artocarpaceae* with the other families and arrived at the following conclusions. With the *Moraceae*, he realised that only the nature of the stamens could be used to delimit them. He maintained that in the *Artocarpaceae*, the filaments are erect excepting the genus *Trophis*; while in the *Moraceae*, they are inflexed excepting the figs. Unfortunately, he failed to realise how useless this filament character is.

Then when he compared the *Artocarpaceae* with the *Urticaceae*, he realised that the tribe *Conocephaleae* is very urticaceous in its female reproductive structures! It was only the nature of the filaments that made him place the *Conocephaleae* in this family.

Trecul thus rendered a great service to the Botany of this group by clearly pointing out the urticaceous nature of the *Conocephaleae*. Besides, he very wisely subjugated the importance of the inflorescence as a characteristic of the *Artocarpaceae*; but in his search for better characters he introduced yet another equally bad character namely the filaments of the stamens. What he should have done was to dissolve the family *Artocarpaceae*, place the tribe *Conocephaleae* in the *Urticaceae* and the rest in the *Moraceae*.

In 1856, Weddell published his monograph of the *Urticaceae* and in the introductory part, he delimited the families of *Urticales* thus:

1. Filaments erect in bud
 2. Flowers hermaphrodite or polygamous *Ulmaceae*.
 2. Flowers unisexual
 3. Herbs with aqueous juice *Cannabinaceae*.
 3. Trees or shrubs with latex *Artocarpaceae*.
1. Filaments inflexed in bud
 2. Ovules anatropous, pendulous *Moraceae*.
 2. Ovules erect, basal *Urticaceae*.

One can clearly see that Weddell certainly took the suggestions made by Trecul and gave prime importance to the filaments of the stamens. As far as his treatment of the *Urticaceae* is concerned, his system was directly patterned along the lines set up by Gaudichaud in 1826; and he made no effort whatsoever to transfer Blume's *Conocephalus* to *Urticaceae*.

In the years 1869 and 1873, the *Urticales* was revised by various botanists in DeCandolle's *Prodromus*. In this system, five families were recognised: *Cannabineae*, *Urticaceae*, *Ulmaceae*, *Moraceae* and *Artocarpaceae*. The composition of the families were much the same as those of the earlier botanists. Bureau distinguished the *Moraceae* from the *Urticaceae* by its apically fixed anatropous ovules and the presence of latex, and from the *Artocarpaceae* by the inflexed stamens as had been done by earlier botanists. He could not use the female flowers for delimiting the *Moraceae* from the *Artocarpaceae* as could be done for the *Urticaceae*, simply because some genera of *Artocarpaceae* agreed in many respects with the *Moraceae* and others (*Conocephaleae*) with *Urticaceae*. In short, Bureau was still seeking the best characters to distinguish *Artocarpaceae*.

In the year 1880, Bentham and Hooker published their "Genera Plantarum". They apparently gave up completely the attempt to distinguish the families of *Urticales* and restored everything back to one family as De Jussieu had done, namely *Urticaceae* (*sensu lato*). This family was divided by them into eight tribes:

Ovulum Pendulum

- Tribe 1. *Ulmaceae*: Flowers mostly hermaphrodite . . . Fruit not a drupe . . . embryo erect.
- Tribe 2. *Celtideae*: Flowers unisexual or sometimes hermaphrodite . . . Fruit a drupe . . . embryo curved.
- Tribe 3. *Cannabineae*: Flowers dioecious . . . stamens erect
- Tribe 4. *Moreae*: Flowers unisexual . . . filaments inflexed
- Tribe 5. *Artocarpeae*: Flowers unisexual, males or both sexes numerous on fleshy receptacles . . . achenes small.

Ovulum Erectum, Orthotropum

- Tribe 6. *Conocephaleae*: Flowers unisexual, stamens erect.
- Tribe 7. *Urticeae*: Flowers unisexual, very rarely hermaphrodite; filaments inflexed . . . embryo erect.
- Tribe 8. *Thelygoneae*: Not *Urticales*!

For the first time, the *Conocephaleae* is completely removed from the *Artocarpeae*. Bentham and Hooker realised the importance of the ovules in distinguishing the sixth and the seventh tribes from the others.

Engler and Prantl, in 1889, solved the problem differently. They simply brought the *Artocarpaceae* and the *Cannabinaceae* completely into the *Moraceae*. Three families were thus recognised by them: *Ulmaceae*, *Moraceae* and *Urticaceae*.

They divided the *Moraceae* into four subfamilies: *Moroideae*, *Artocarpoideae*, *Conocephaloideae* and *Cannaboideae*. In this system, the genus *Conocephalus* of Blume thus became the type genus of a subfamily! This is the system which many botanists of today adopt.

Now it is fully understandable why the genus *Poikilospermum* in its present concept is both *Moraceae* and *Urticaceae*. A part of this genus which was formerly known as *Conocephalus*, had been gradually brought from tribe *Artocarpeae* to occupy eventually a firm position in the *Moraceae*.

It has been pointed out earlier that this genus is now held to belong to the *Urticaceae*. The problem is solved by splitting the subfamily *Conocephaloideae* into two portions. One portion containing the genera *Cecropia*, *Coussapoa* and *Musanga* is brought over to the *Urticaceae* as a separate tribe since these genera have the typical basal and orthotropous ovules. The other portion containing the genera *Pourouma* and *Myrianthus* is retained in the *Moraceae*. This will definitely leave the two families clearly distinguished from each other so that *Poikilospermum* can safely be taken as belonging to the *Urticaceae*.

Belonging to the tribe *Boehmerieae*, this genus *Poikilospermum* seems to be related, morphologically, to genera *Touchardia*, *Debregeasia* and *Villebrunea*.

Of the three, *Touchardia* seems to be the closest relative, especially with subgenus *Ligulistigma*. While in *Ligulistigma* the inflorescences are bracteate, those of *Touchardia* are not; also, sessile capitulas are never present in the axils of peduncular branches as these are in *Touchardia*. Regarding the genera *Debregeasia* and *Villebrunea*, these differ from *Poikilospermum* chiefly in the perianth of the female flowers. In *Debregeasia*, the perianth is generally succulent at fruit and in *Villebrunea*, it becomes adnate to the fruit. These phenomena are not found in *Poikilospermum*.

Geographical Distribution

Poikilospermum is a genus of woody scramblers confined entirely to the Rain Forests of the Indo-Malaysian Formation. The twenty species recognised for this genus are all evergreen, and they flower and fruit practically throughout the year. Riverine and swampy forests or similarly damp habitats of lowlands seem to be their preferences. However, a few collections had been made by some botanists from drier habitats like limestone hills, but these are indeed very rare; while a few others had come from altitude as high as 2,000 metres.

It is necessary that the geographical divisions should be defined before proceeding with the discussion of the phytogeography of the genus. Van Steenis in 1950, laid down the limits of the Malaysian Region which he claimed to be “. . . accepted as a natural geographical unit.” The Malay Peninsula, Sumatra, Borneo, the Philippine Islands, Java, Lesser Sunda Islands, Celebes, Moluccas, New Guinea and part of the Bismarck Archipelago are the territories which he accepted as within Malaysia (fig. 7). Siam, Indo-China, Burma and the rest of the mainland of Asia are excluded from it; so are the Solomon Islands, which lie just outside the south eastern boundary. Within Malaysia, three floristic subdivisions are recognised by him. The Malay Peninsula, Sumatra, Borneo and the Philippine Islands are collectively termed Western Malaysia; and the Celebes, Moluccas and New Guinea as well as part of the Bismarck Archipelago make up Eastern Malaysia. The rest, that is Java and the Lesser Sunda Islands, are referred by him as Southern Malaysia.

In this work, the term Malaysia is taken to include the whole of the Bismarck Archipelago. Within Malaysia itself, a slight change is also made. The Philippine Islands are here considered as forming a distinct floristic unit by themselves.

The genus as a whole is mainly centred in Malaysia. North and north-westward, it extends to as far as the Sino-Himalayan Region, that is slightly north of the Tropic of Cancer; and is not found either in Peninsula India or in Ceylon (fig. 8). Neither is it present in the island of Hainan which lies to the south-east of Tonkin. To the south it stops short at Java, and is singularly absent from the Lesser Sunda Islands. The Woodlark Island marks the eastern limit of the genus. This pattern of distribution of the genus fits almost perfectly with that of *Parartocarpus* (*Moraceae*) as drawn by Jarrett with two exceptions. While *Parartocarpus* is totally absent from Continental Asia, *Poikilospermum* is represented there by four species. Then again in the Solomon Islands, *Parartocarpus* is represented but not *Poikilospermum*. The absence of both genera from the Lesser Sunda Islands is perhaps due to the fact that these genera cannot tolerate the dry season of these islands.

The distribution of all the species of *Poikilospermum* is clearly laid out in figure 9 at the base of which are two horizontal columns. The first one shows for each country the total number of species present while the lower column records the number of endemic species.

From this chart, one can clearly see that Borneo has the lion's share of the species. Of a total of twenty, eight have been recorded from this huge island, three of which are endemics. Next comes Sumatra which has seven with also three endemics. The Malay Peninsula, the Philippine Islands and New Guinea have

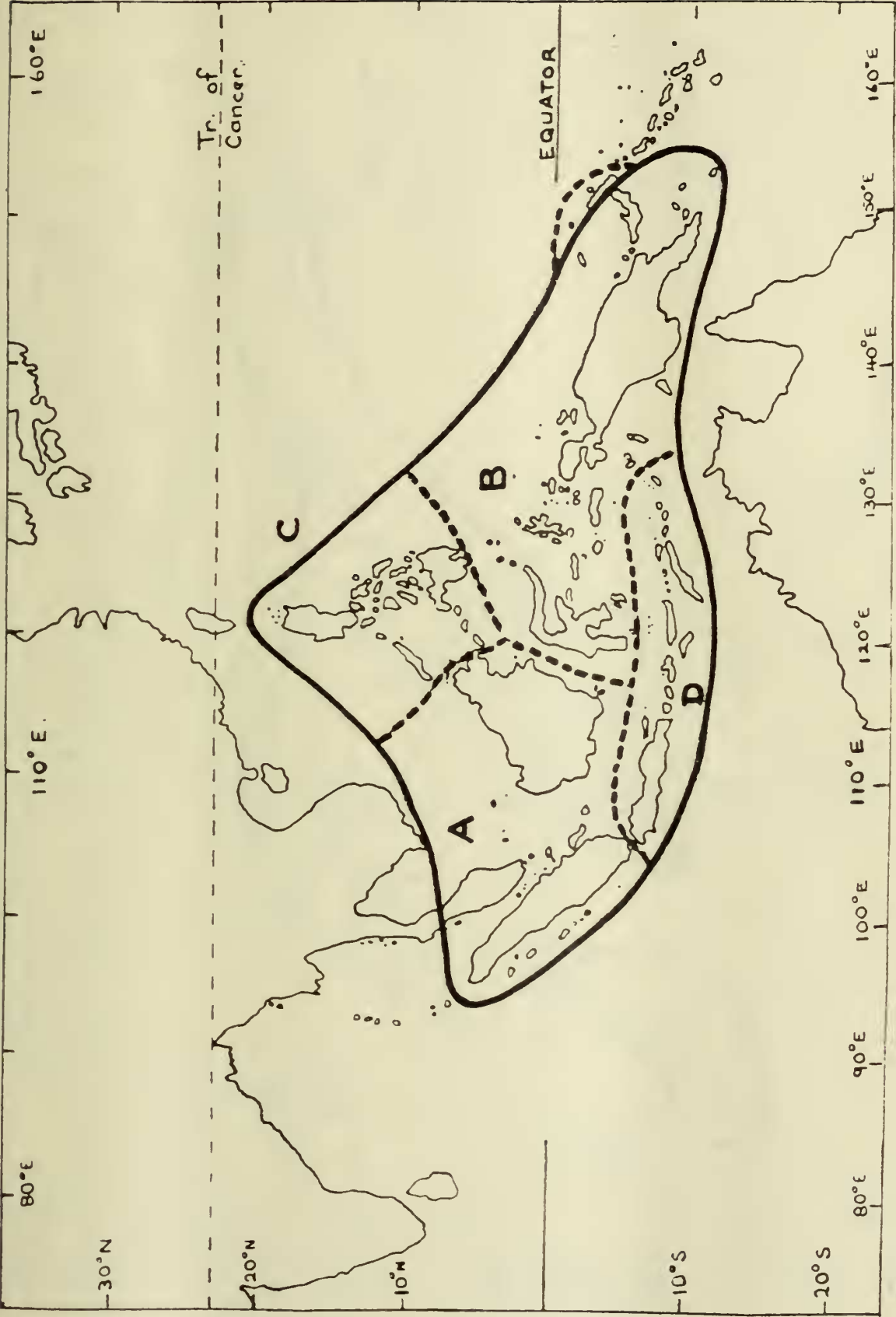


Fig. 7. Floristic divisions of Malaysia. A, Western Malaysia. B, Eastern Malaysia. C, Northern Malaysia. D, Southern Malaysia.

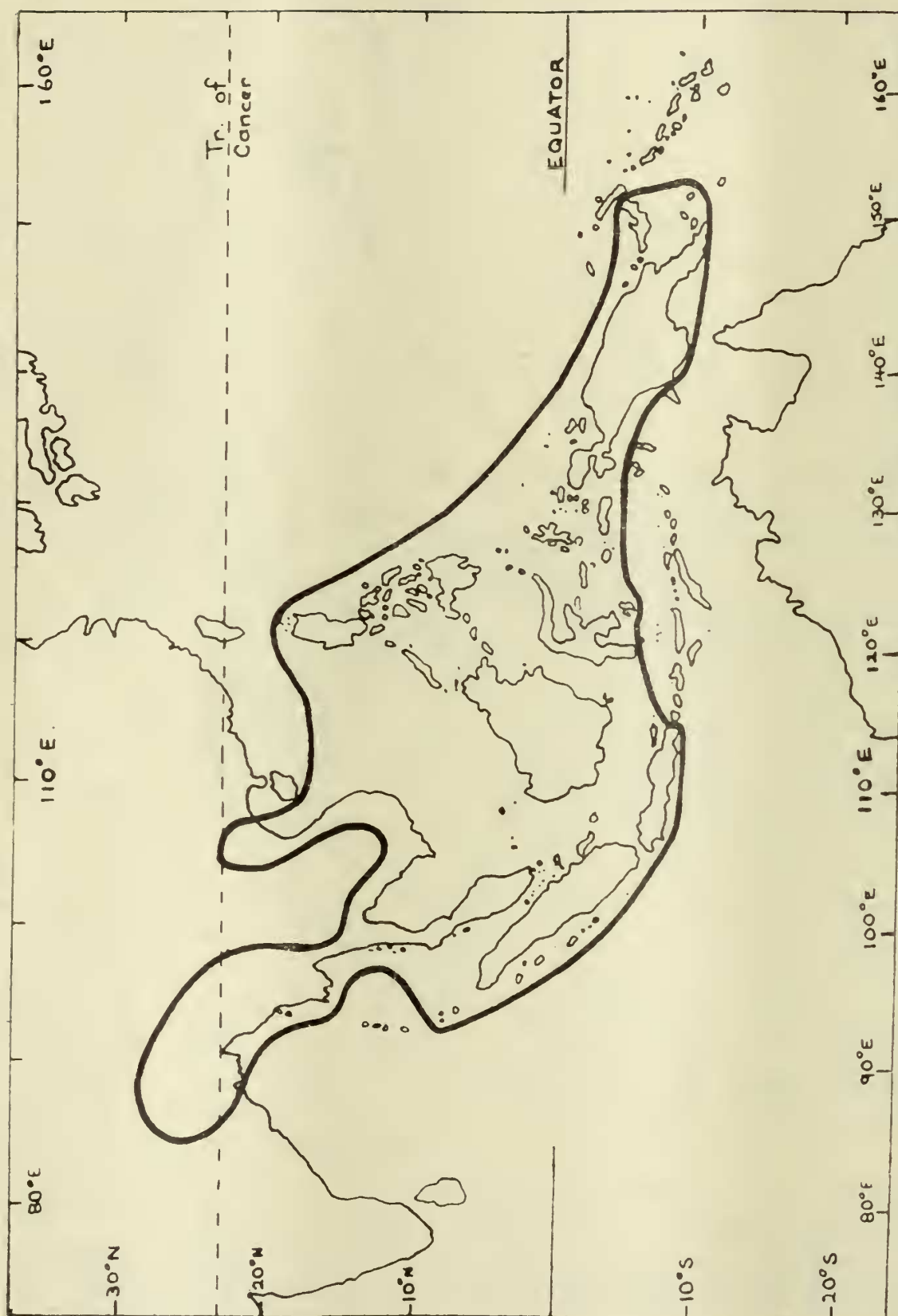


Fig. 8. Distribution of genus *Poikilospermum* Zipp. ex Miq.

COUNTRIES SPECIES		ASIA					ANDAMAN IS.	NICOBAR IS.	WESTERN MALAYSIA			PHILIPPINE IS.	SOUTH MALAYSIA		EASTERN MALAYSIA			
		INDIA	BURMA	CHINA	SIAM	INDOCHINA			SUMATRA	MALAY PEN.	BORNEO		JAVA	L. SUNDA IS.	CELEBES	MOLUCCAS	NEW GUINEA	BISMARCK IS.
Subgen. POIKILOSPERMUM	acuminatum											●						
	nobile																●	
	paxianum																●	
	inaequale																●	●
	amboinense															●	●	●
Subgen. LIGULISTIGMA	microstachys								●	●	●							
	tangaum										●							
	oblongifolium										●	●						
	annamense					●												
	cordifolium								●	●	●							
	subtrinervium								●									
	suaviolense	●		●	●	●		●	●	●	●	●		●	●			
	erectum											●						
	naucleiflorum	●	●		●													
	singalense								●									
	azureum								●									
	peltatum										●							
	lanceolatum	●	●	●														
	scortechinii									●	●	●						
	scabrinervium											●						
Total no. species		3	2	2	2	2	NIL	1	7	4	8	4	1	NIL	1	2	4	2
Endemic species		NIL	NIL	NIL	NIL	1	-	NIL	3	NIL	3	2	NIL	-	NIL	NIL	2	NIL

Fig. 9. Distribution Chart of species of *Poikilospermum* Zipp. ex Miq.

four species each; but while no endemic has been recorded from the former territory, half of the number of species in the latter territories are endemics. In Continental Asia, four species have been recorded. India has three and the rest have two species each. Taken individually, only Indo-China amongst the Continental countries has one endemic species, the rest nothing. On the other hand, if Continental Asia is taken as a unit, three of the four species can be accorded endemic status, namely *P. annamense*, *P. naucleiflorum* and *P. lanceolatum*.

In short, it can be generalized that this genus has two centres of distribution in Malaysia and a minor one in Continental Asia. The centres in Malaysia are (a) The Bornean centre in Western Malaysia and (b) The New Guinean Centre in Eastern Malaysia. To realise fully the significance of this generalization, it is necessary to examine critically the distribution pattern of the two subgenera of this genus.

Subgenus *Poikilospermum*: This subgenus has five species: *P. acuminatum*, *P. nobile*, *P. paxianum*, *P. inaequale* and *P. amboinense*. Of these, only one, *P. acuminatum*, is absent from Eastern Malaysia; it is an endemic of the Philippine Islands (fig. 10). The other four species are totally confined to Eastern Malaysia, especially in the island of New Guinea. It will be recalled that the species *P. acuminatum* is very odd in that it combines characters of the two subgenera *Poikilospermum* and *Ligulistigma* and is the only species of the former subgenus to approach the latter in circumscription. It is indeed very significant that this species should be confined to the Philippine Islands.

Regarding the other four species of Eastern Malaysia, all have been recorded from New Guinea. Two of these, *P. nobile* and *P. paxianum*, are endemics. It was Ridley who described *P. nobile* from only two collections made in South New Guinea. Up till now, no subsequent collection of it has yet been made. The other endemic species, *P. paxianum*, has so far been collected from Central New Guinea. The area covered by this species is certainly much larger than that of the former. The third species, *P. inaequale*, covers even a larger area. It is not only found in the north-eastern half of New Guinea, but also found in the western half of the island of New Britain. The fourth species *P. amboinense*, is the most widespread and extends from New Britain in the east, right across the north-eastern two-thirds of New Guinea to as far west as Ceram and Boeroe in south Moluccas. The reasons for the absence of *P. amboinense* from the south-western part of New Guinea are hard to find. It cannot be entirely due to the lack of exploration of this part since the north-western peninsula of New Guinea, from which this species has been recorded, is as much unexplored as the south-western. It is probably due to a combination of two factors: lack of exploration as well as the scarcity of the species from that region.

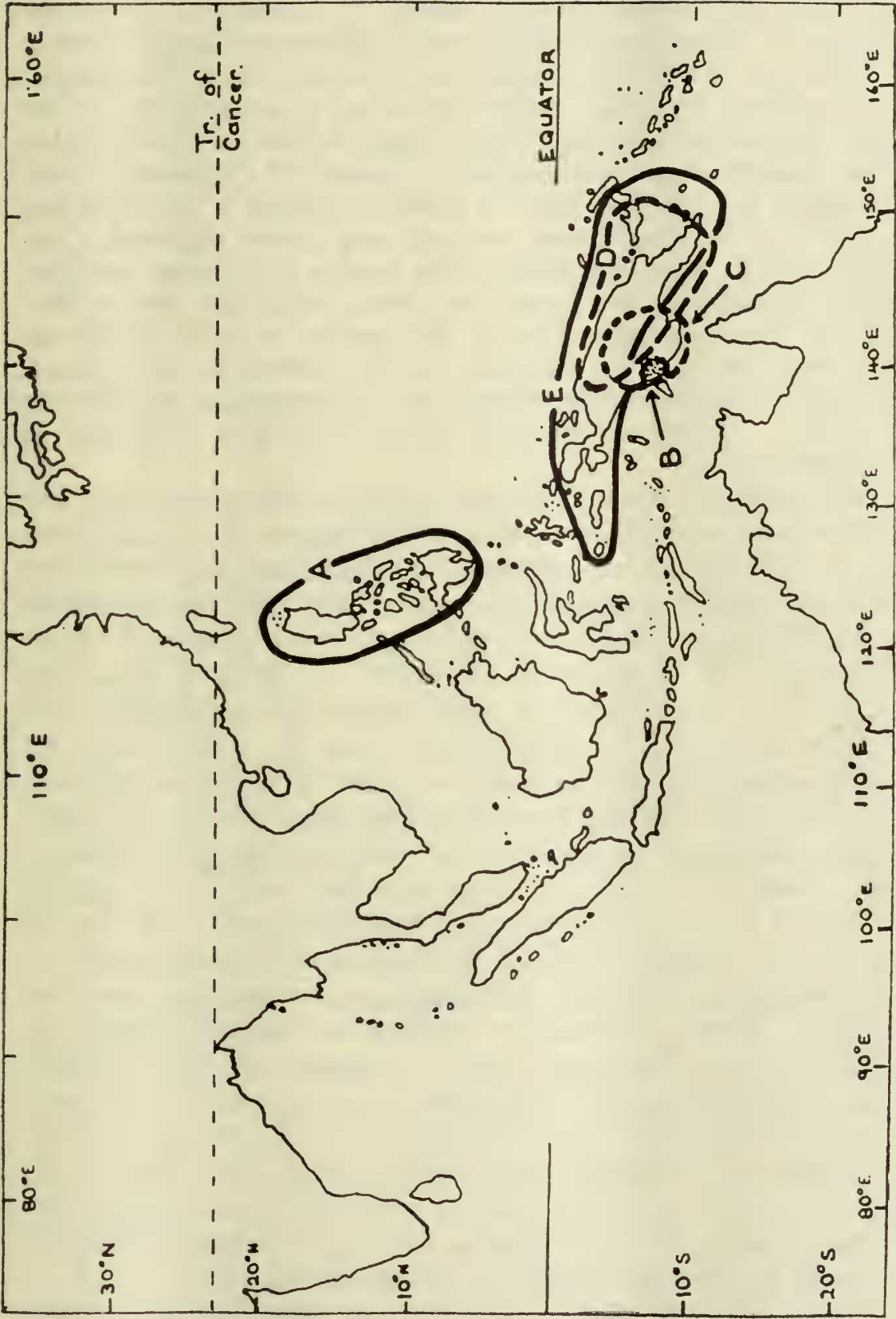


Fig. 10. Distribution of: *P. acuminatum* (A); *P. nobile* (B); *P. paxianum* (C); *P. inaequale* (D); *P. amboinense* (E).

The subgenus *Poikilospermum* therefore shows a discontinuous pattern of distribution. The main part of it is centred in New Guinea while the other part, which contains only one species, is endemic in the Philippine Islands.

Subgenus *Ligulistigma*: Fifteen species have so far been recorded for this subgenus. It is to this subgenus that the species with the widest distribution belongs, namely *P. suaveolens*. As shown in figure 11, this species occurs practically everywhere in Western Malaysia, the Philippine Islands and Celebes; but in Continental Asia, Southern Malaysia and the Moluccas, it occurs only in some parts. Its absence from the Lesser Sunda Islands is probably due to the presence there of a distinct dry season. In Continental Asia, its absence from Burma and the interior of Siam is probably due to the fact that these places are still very poorly explored. Consistent with its wide distribution, this species is the most variable, morphologically, in the genus (see notes under the specific description). Also, in each country, this species is given a different vernacular name. For instance, it is known as Chentawan, Sentawan or Mentawan in Malaya. In the Philippines it is known as Anopo, Anopol or Hanopol while in Java it is known as Kekkegoan aroy.

The other fourteen species are segregated fairly well into two distributional areas. Three species, *P. annamense*, *P. naucleiflorum* and *P. lanceolatum* are confined to Continental Asia while the others are mainly Western Malaysian species with few extensions to the Philippine Islands. Of the Continental species, *P. annamense* seems to be the most restricted. As shown in figure 12, it has so far been recorded from Annam in Indo-China. The other two species, *P. naucleiflorum* and *P. lanceolatum*, are centred around the Sino-Himalayan region. Only *P. naucleiflorum* has so far been recorded from Peninsular Siam close to the north-western boundary of Malaysia. In other words, if Continental Asia is taken as a unit, it has three endemic species. This explains the reason for an earlier statement that Continental Asia can be taken to be a minor centre of distribution of *Poikilospermum*.

Regarding the Western Malaysian centred species, seven are endemics. Three of these are confined to Sumatra namely, *P. subtrinervium*, *P. singalense* and *P. azureum* (fig. 13); another three in Borneo namely *P. peltatum*, *P. tangaum* and *P. scabrinervium* (fig. 14); and one in the Philippines i.e. *P. erectum* (fig. 15). The species *P. oblongifolium*, first recorded from Borneo by Beccari, is the only other Western Malaysian species apart from *P. suaveolens* to have managed to reach the Philippine Islands—and only the southern island of Mindanao (fig. 15).

Lastly, there are three species of this subgenus which show very similar distributional patterns. These are *P. microstachys*, *P. cordifolium* and *P. scortechinii* (fig. 16). They cover almost the same area except that (a) *P. microstachys* is found throughout Borneo while the others are mainly north Bornean, and (b) *P. scortechinii* seems rather scarce in North Sumatra.

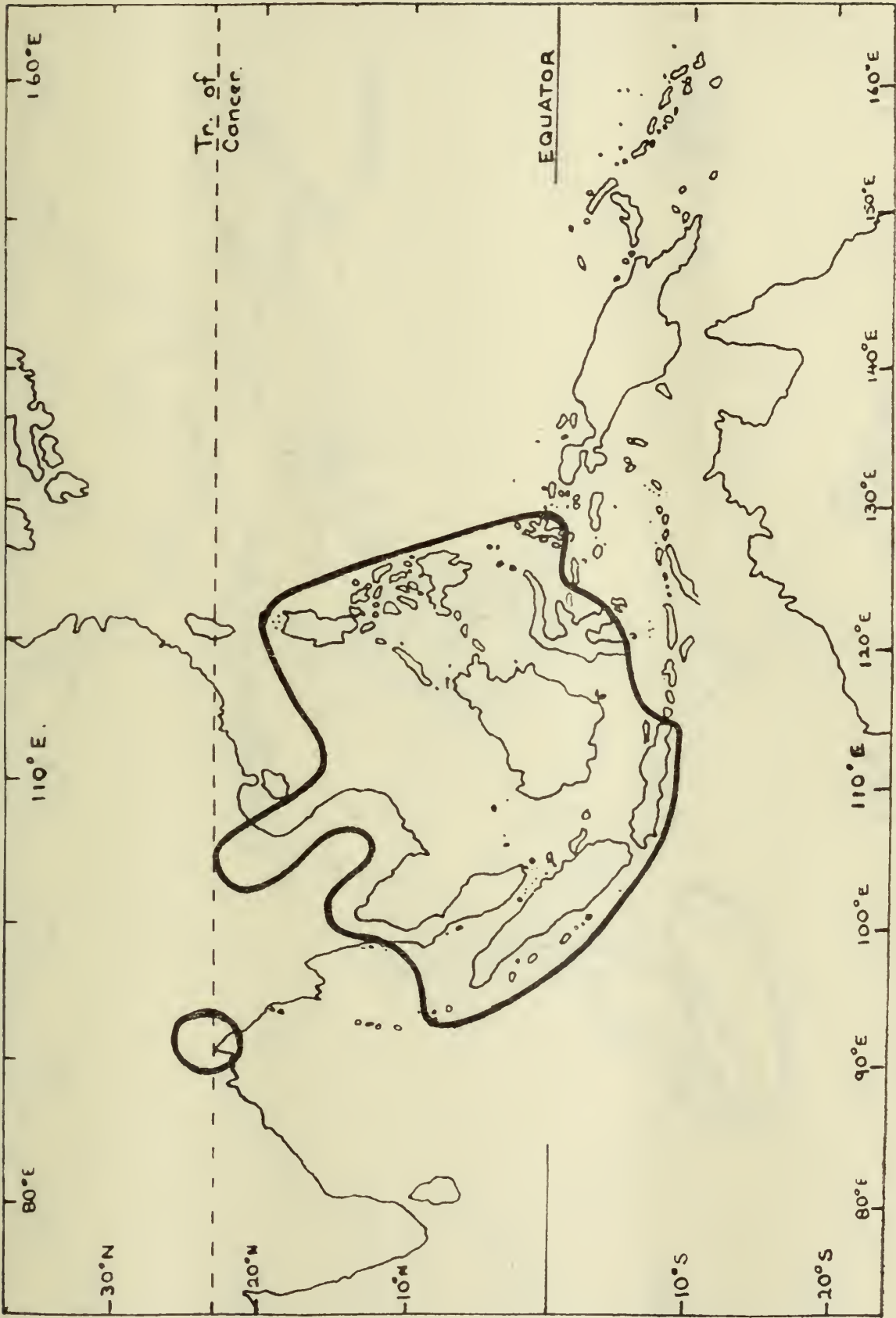


Fig. 11. Distribution of *P. suaveolens*.

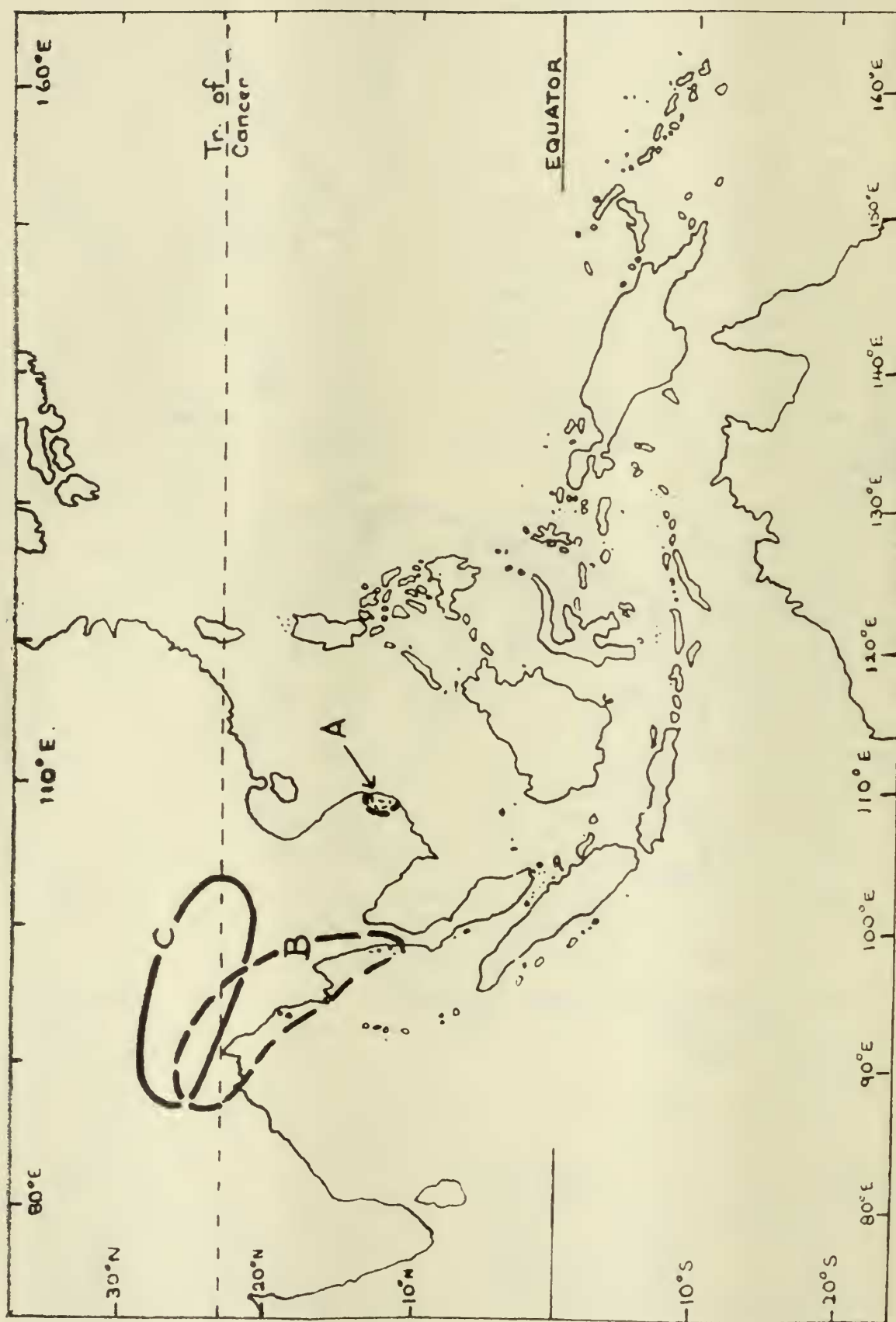


Fig. 12. Distribution of: *P. annamense* (A); *P. naucleiflorum* (B); *P. lanceolatum* (C).

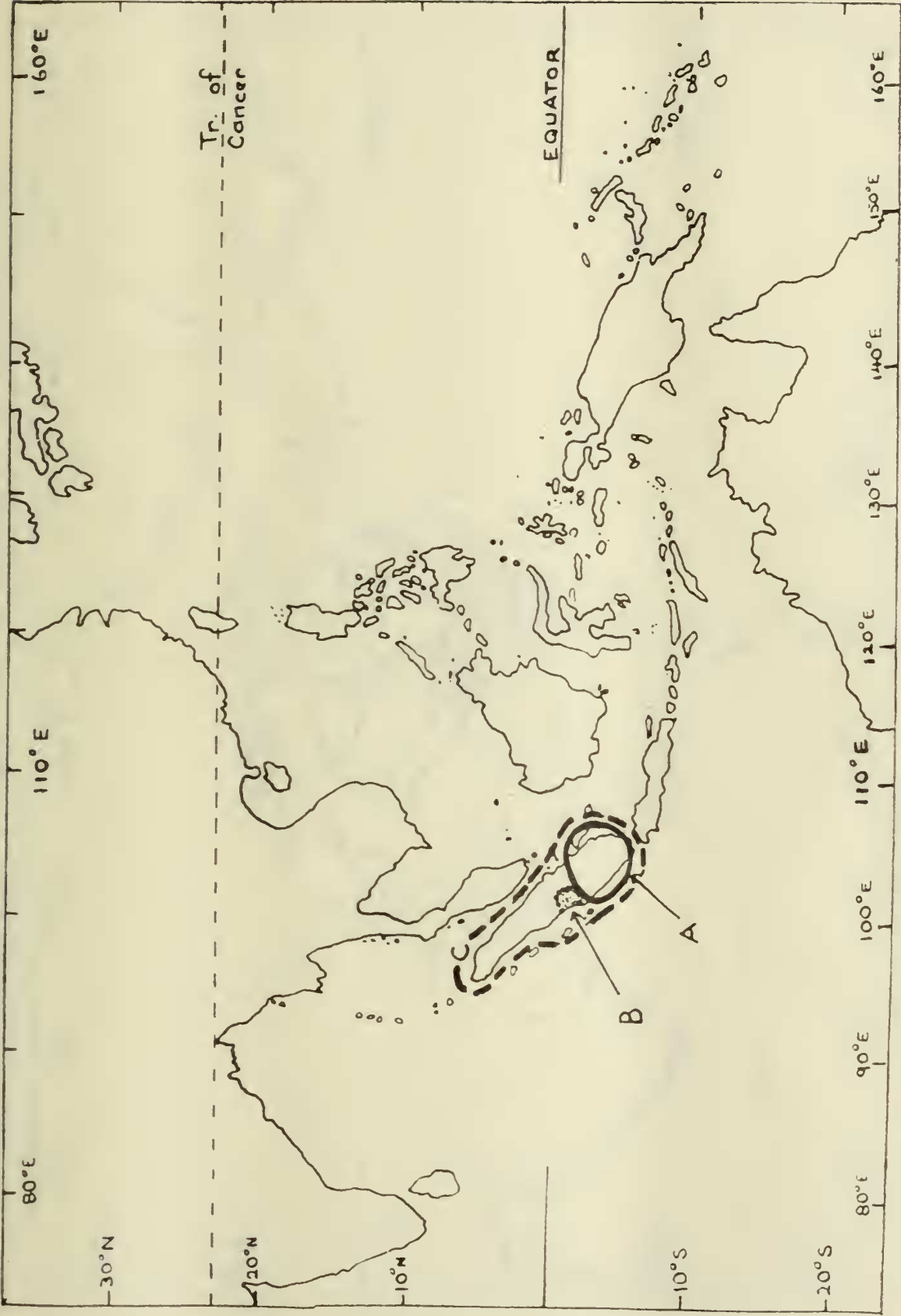


Fig. 13. Distribution of: *P. subtrinervium* (A); *P. singalense* (B); *P. azureum* (C).

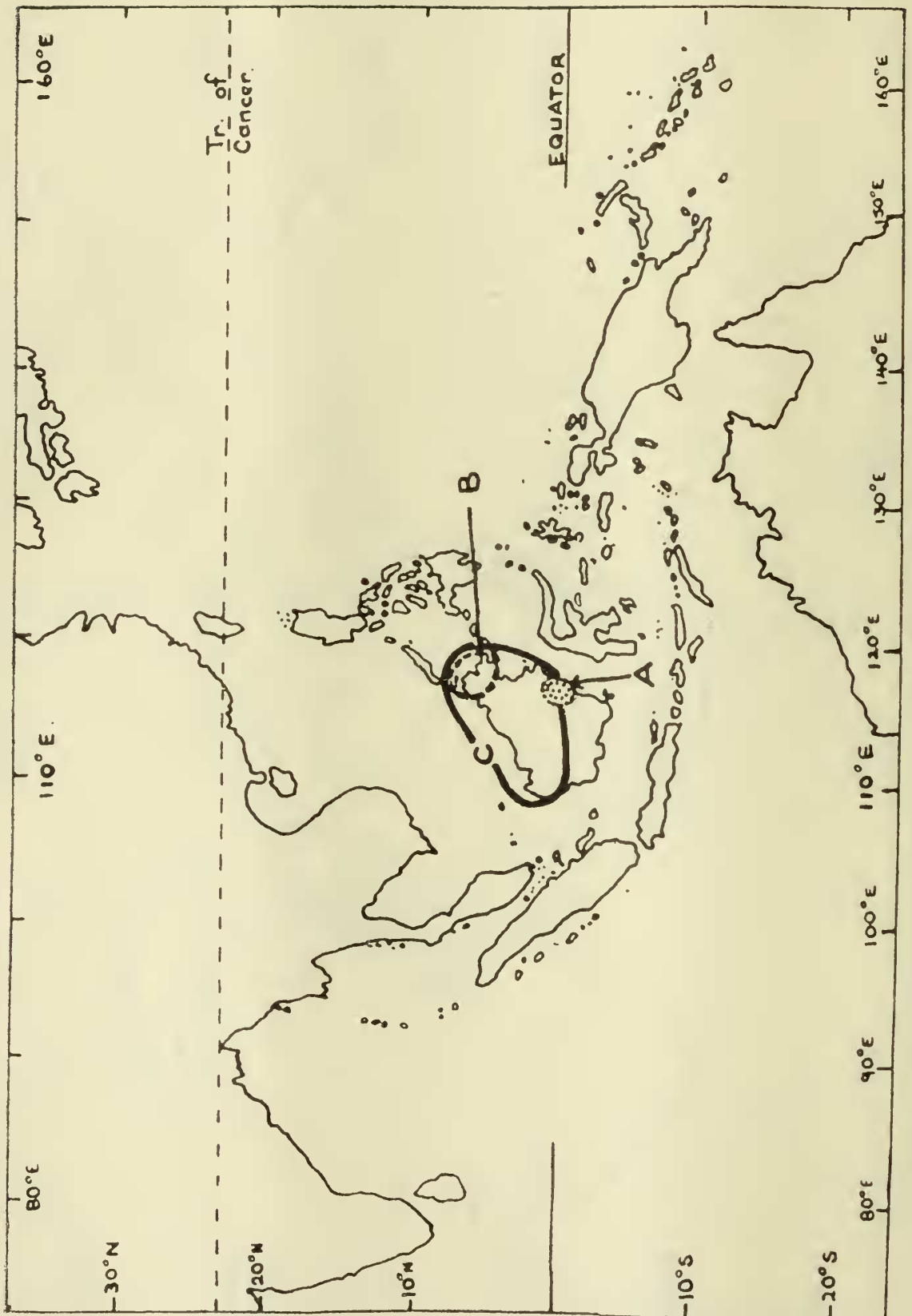


Fig. 14. Distribution of: *P. peltatum* (A); *P. tangaum* (B); *P. scabrinervium* (C).

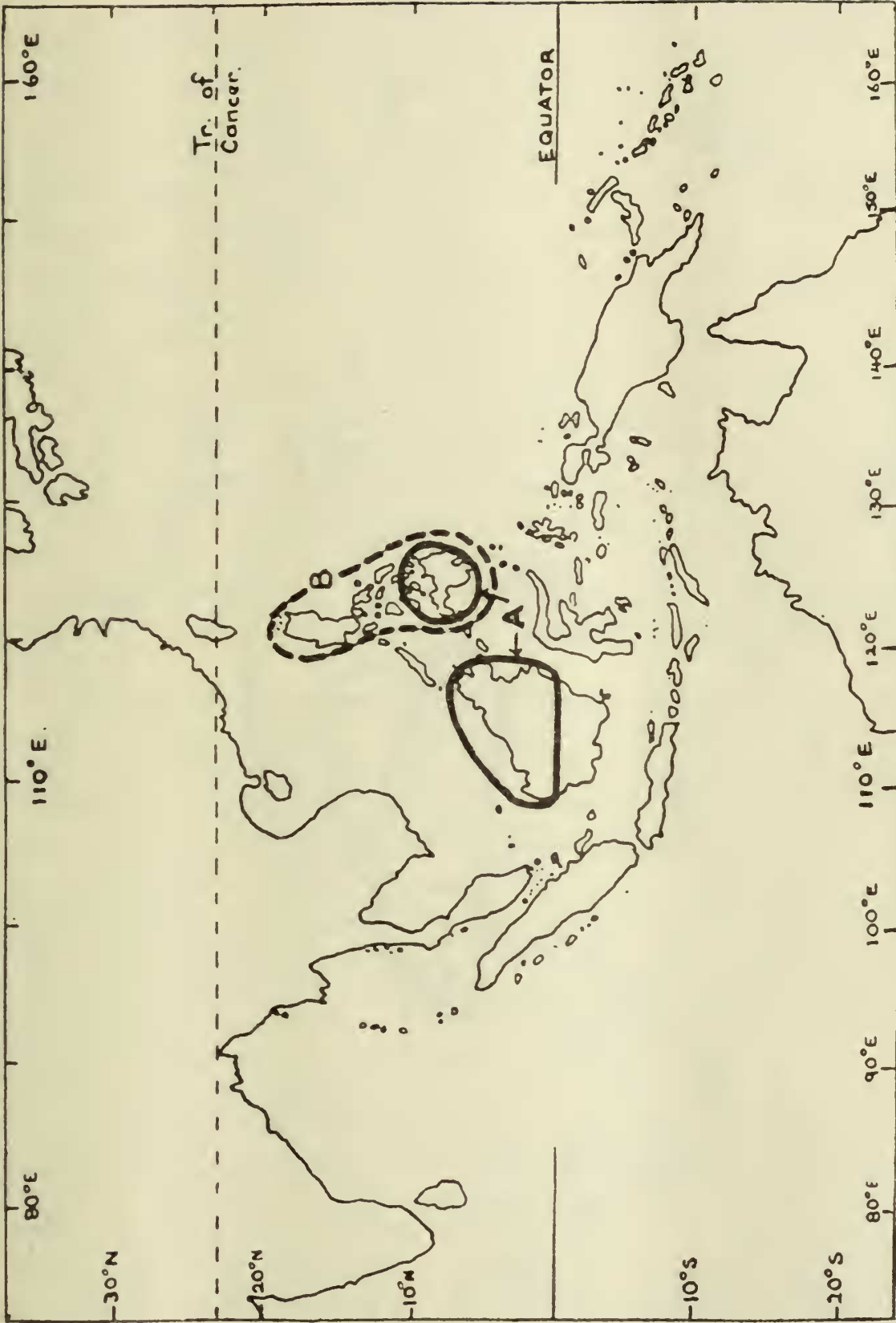


Fig. 15. Distribution of: *P. oblongifolium* (A); *P. erectum* (B).

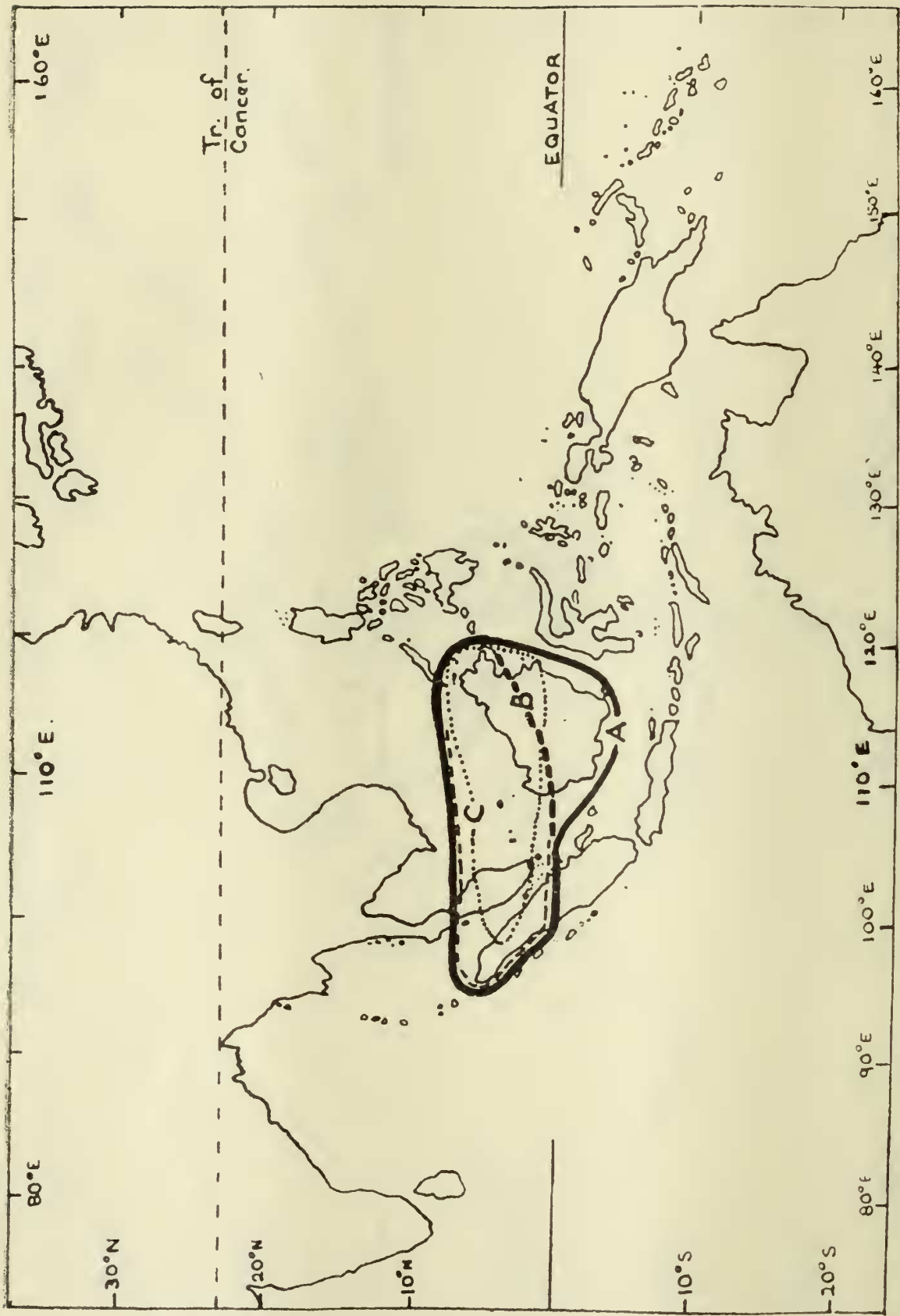


Fig. 16. Distribution of: *P. microstachys* (A); *P. cordifolium* (B); *P. scortechinii* (C).

From the details given above, one can clearly see that the *Poikilospermum*-flora of Continental Asia and Western Malaysia is wholly dominated by the species of subgenus *Ligulistigma*, one of which has even managed to cross the so-called "Wallace's Line" into Eastern Malaysia.

In general, one can conclude that the genus *Poikilospermum*, though small, does in fact bear out the floristic nature of Malaysia remarkably well. The Malaysian Archipelago has been claimed by numerous botanists to be a fairly natural phytogeographical unit. The distribution of *Poikilospermum* can therefore be an added evidence of this claim for it is essentially a Malaysian genus with only a slight extension to Continental Asia.

About the subdivisions of Malaysia itself, there have been considerable differences of opinion although most people agree generally that Malaysia can primarily be divided into a Western subdivision (or Sundaland) and an Eastern one (or Sahulland). Van Steenis (1950) divided, as mentioned earlier, Malaysia into three parts: Western Malaysia, Eastern Malaysia and Southern Malaysia basing his evidence on the generic distribution of lowland flowering plants. Southern Malaysia, according to him, has a relatively poor flora. This is certainly shown very well by the distribution of *Poikilospermum*. Of a total of twenty species, only one, *P. suaveolens*, and a very widespread one too, occurs in Southern Malaysia.

Regarding Western and Eastern Malaysia, much evidence has already been gathered to maintain that the floras of these two regions are rather dissimilar. Merrill (1926) stated, "In considering Malaysia as a whole, it is clear that two secondary centres of origin and distribution have been established since the break-up of the Cretaceous continental area. One of these is composed of Sunda Islands or Sundaland; the other is New Guinea or Papualand." The distribution of *Poikilospermum* clearly justifies this statement. It has been found that subgenus *Ligulistigma* dominates the *Poikilospermum*-flora of Western Malaysia, while the counterpart in Eastern Malaysia is subgenus *Poikilospermum*.

Lastly, the Philippine Islands. Geologically, these islands do not properly lie within the Sundaland, and yet, as pointed out by Merrill, the flora is certainly very closely allied with that of Western Malaysia. However, he also noted that there are other elements present in the Philippines which are closely related with those of Papualand. Airy-Shaw (1941) suggested that it would be better to consider the Philippines as constituting a separate subdivision of Malaysia "... in view of the very considerable affinities shown by certain other elements in the Philippine flora with Celebes, the Moluccas and New Guinea." to quote his words. Jarrett (1956), basing on the distribution of *Artocarpus* (*Moraceae*), also maintained that these islands should belong to a separate subdivision. The distribution of *Poikilospermum* clearly supports the separation

of these islands from others of Malaysia. It is no doubt true that the *Poikilospermum*-flora of these islands is a mixture of both Sundaland and Papualand elements; but on closer examinations, those occurring in the Philippines do show some distinction. To begin with, there are four species of this genus present in these islands. Two of these are endemics: *P. acuminatum* (subgenus *Poikilospermum*) and *P. erectum* (subgenus *Ligulistigma*). The other two, *P. oblongifolium* and *P. suaveolens* are doubtless species mainly centred in Western Malaysia; but the Philippine populations of these are somewhat different from their Western Malaysian counterparts. For example, the Philippine populations of *P. oblongifolium* seem to have, in the male flowers, pistillodes with rather swollen and globular heads whereas such pistillodes have not been observed in those of Borneo. Two geographical subspecies could easily have been established for it but for the fact that not much material has been available to assess the reliability of this character. With *P. suaveolens*, the Philippine populations tend to have leaves that are never so coriaceous as those of Western Malaysia; besides, their twigs seem to be more lenticellate than those of, for example, populations of the Malay Peninsula.

For these reasons, it is preferred in this work to treat the Philippine Islands as forming a distinct subdivision of Malaysia as had been done by Jarrett (1956). Perhaps, we can call the Philippine subdivision North Malaysia.

POIKILOSPERUM Zipp. ex Miq.

Poikilospermum Zipp. ex Miq. Ann. Mus. Bot. Ludg.—Bat. **1**: 203 (1864); Wedd. DC. Prodr. **16** (1): 235¹⁵ (1869); Baillon, Nat. Hist. Pl. **3**: 529 (1874); Benth. et Hk. f. Gen. Pl. **3**: 389 (1880); Engl. in Engl. et Prantl, Pflanzen. **3** (1): 114 (1889); Merr. Contr. Arnold Arbor. **8**: 47 (1934); Backer, Bek. Fl. Java **6**: 53 (1948).

TYPE SPECIES: *P. amboinense* Zipp. ex Miq.

Conocephalus Bl. Bijdr. 483 (1825), non Necker (1790); Endlich. Gen. Pl. 281 (1836–1840); Trec. Ann. Sci. Nat. ser. 3. **8**: 87 (1847); Miq. Fl. Ind. Bat. **1** (2): 283 (1859); Bur. DC. Prodr. **17**: 284 (1873); Kurz, For. Fl. Br. Burm. **2**: 429 (1877); Benth. et Hk. f. l. c. 380; Baillon, l. c. **6**: 215 (1880); Hk. f. Fl. Br. Ind. **5**: 545 (1888); Engl. l. c. 93; Warb. Bot. Jahrb. **18**: 189 (1894); Barg.—Petr. Nuovo G. Bot. Ital. n. ser. **9**: 213 (1902); Renner, Bot. Jahrb. **39**: 407 (1907); Winkl. Bot. Jahrb. **57**: 595 (1922); Ridl. Fl. Mal. Pen. **3**: 356 (1924); Gagnepain, in Lecomte, Fl. Gen. Indo-Chine **5**: 830 (1929).

Balansaeophytum Drake, Bull. Soc. Bot. France **43**: 83 (1896).

Conocephalopsis Kuntze, Rev. Gen. Pl. **3** (2): 136 (1898).

Dioecious woody scramblers. Twigs with smooth to split periderm. *Lamina* variable in shape and size; always simple, entire and spirally arranged; petiolate; usually coriaceous; cystoliths of adaxial surface arranged in circular groups, those of abaxial surface arranged along veins, either punctiform or elongate in shape. *Petioles* variable in length, canalised on upper surface; periderm smooth, cystoliths visible or not, or split into copper-brown flakes. *Stipules* connate, intrapetiolar, always canalised on the back; usually very coriaceous, sometimes woody; strongly crescentic to long and straight in shape; caducous to persistent. *Inflorescences* axillary, cymose; often solitary, rarely paired to numerous; branched once to many times; peduncles bracteate; peduncular bracts small to large and foliaceous, usually paired; flowers borne crowded together on swollen peduncular receptacles, or in agglomerations without such receptacles or even free; interfloral bracts minute, very often absent; solitary terminal flowers present or absent from the axils of ultimate dichotomies of inflorescences. *Flowers* generally small to minute, unisexual, sessile to long pedicellate. *Male flowers*: perianth glabrous to thick pubescent; tepals 2 to 4, free or slightly gamophyllous, usually strongly incurved at apex; stamens 2 to 4, inserted around the pistillode and opposite to tepals, filaments straight to inflexed; anthers laterally dehiscent; pistillode always present, large to very small. *Female flowers*: perianth glabrous to pubescent, gamophyllous; apex 4-toothed or 4-lobed, the lobes usually 2 + 2 decussate-imbricate; ovary superior, 1-carpelled, unilocular, ovoid to ellipsoid; ovule solitary, basal and orthotropous; stigma subsessile, ligulate, oblique-capitate to peltate-capitate; rudiments of stamens absent. *Fruits* dry, small brownish achenes, ovoid to ellipsoid, pericarp slightly warty; either totally enclosed by perianth or protruding a long way out of it; embryo straight, with rather oblong, equal cotyledons.

DISTRIBUTION: From the Sino-Himalayan Region in Continental Asia, through Malaysia to the Bismarck Archipelago, the eastern-most limit of Malaysia.

KEY TO THE SUBGENERA

1. a. Inflorescences non-capitate; male inflorescences with solitary terminal flowers in axils of ultimate dichotomies; filaments inflexed in bud; female flowers with 4-toothed perianths and with capitate, subsessile stigmas; matured achenes usually greatly exserted from the persistent perianths; plants mainly of eastern Malaysia
subgen. *Pcikilospermum*.
- b. Inflorescences capitate; without solitary terminal flowers; filaments erect in bud; female flowers with 4-lobed perianths; stigmas ligulate, subsessile; matured achenes usually totally enclosed by persistent perianths; plants mainly of western Malaysia
subgen. *Ligulistigma*.

Subgenus *Poikilospermum*

Conocephalus group *Poikilospermum* Barg.-Petr. Nuovo G. Bot. Ital. n. ser. **9**: 216 (1902).

Conocephalus subgen. *Poikilospermum* Winkl. Bot. Jahrb. **57**: 595 (1922).

Periderm of twigs not splitting. *Stipules* usually long and straight, very rarely crescentic. *Male inflorescences* free-flowered, rarely with flowers in small agglomerations; solitary terminal flowers present in ultimate dichotomies; peduncular bracts small to large, very rarely foliaceous. *Female inflorescences* same as the males excepting the absence of solitary terminal flowers in ultimate dichotomies of species *acuminatum*. *Male flowers* sessile to subsessile, very rarely pedicellate; filaments of stamens inflexed in the bud. *Female flowers* sessile to subsessile, very rarely pedicellate; perianth 4-toothed; stigma oblique-capitate or peltate-capitate. *Achenes* at maturity at least half, often more, exserted from the persistent perianth.

DISTRIBUTION: Plants of the Philippine Islands and Eastern Malaysia.

KEY TO SPECIES OF SUBGEN. POIKILOSPERMUM

1. a. Solitary terminal flowers absent from ultimate dichotomies of female inflorescences, present only in the male; flowers in "incipient" capitula; stigmas oblique-capitate; filaments inflexed at apices only; stipules strongly crescentic (1) ***P. acuminatum***.
- b. Solitary terminal flowers present in ultimate dichotomies of male and female inflorescences; flowers separate or at most in small agglomerations; stigmas peltate-capitate; filaments usually wholly inflexed; stipules straight, long or only slightly curved 2.
2. a. Filaments as broad as tepals; stamens 4; flowers subsessile; lamina very large, at least 40 to 70 cm. long $\times$ 18 to 25 cm. broad; obovate; lateral veins very prominent, closely set, more than 18 pairs; intercostals very straight and prominent, very numerous and closely set (4) ***P. nobile***.
- b. Filaments much narrower than tepals; stamens 2 to 4; flowers sessile, subsessile to pedicellate; lamina small, 8 cm. long $\times$ 3 cm. broad, to as large as those of above species, elliptic or ovate i.e. broadest at or below the middle; lateral veins 6 to 16 pairs, rarely 18; intercostals almost not evident, to very many and prominent 3.
3. a. Male and female flowers distinctly pedicellate; pedicel as long, sometimes longer, than perianth; peduncles thickly canescent; lamina large elliptic; lateral veins 13 to 18 pairs, closely set; intercostals prominent (5) ***P. paxianum***.
- b. Male and female flowers sessile or subsessile; pedicel shorter than perianth; only the solitary terminal flowers distinctly pedicellate; peduncles glabrous to thickly pubescent, very rarely canescent; lamina variable; lateral veins less than 14 pairs 4.
4. a. Perianth of male flowers splitting irregularly into 2 to 5 unequal parts; secondary peduncles of male inflorescences of unequal lengths, very thin and flimsy; flowers free or at most 5 in each agglomeration; usually more than 2 inflorescences at each axil; plants very frail; twigs thin and weak; lamina elliptic; intercostals very faint
(3) ***P. inaequale***.
- b. Perianth of male flowers splitting regularly into 2 to 4 equal parts; peduncles stouter, secondary ones usually equal in length; more than 5 flowers in each male floral agglomeration; generally less than 2 inflorescences at each axil; plants stout, twigs thick to very robust; lamina variable; intercostals prominent
(2) ***P. amboinense***.

1. **Poikilospermum acuminatum** (Trec.) Merr. Contr. Arnold Arbor. **8**: 48 (1934).

Conocephalus acuminatus Trec. Ann. Sci. Nat. ser. 3. **8**: 91 (1847); Miq. Fl. Ind. Bat. **1** (2): 284 (1859); F.-Villar, Novis. App. Fl. Philipp. Blanco 203 (1880); Vidal, Phan. Cuming. Philipp. 146 (1885) et Rev. Pl. Vasc. Filip. 255 (1886); Barg.-Petr. Nuovo G. Bot. Ital. n. ser. **9**: 221 (1902); Winkl. Bot. Jahrb. **57**: 596 (1922); Merr. Enum. Philipp. Fl. Pl. **2**: 70 (1923).

Procris grandis Wedd. Arch. Mus. Hist. Nat. **9**: 337 (1856) et DC. Prodr. **16** (1): 193 (1869); Miq. l.c. 249; Vidal, Phan. Cuming. Philipp. 146 (1885) et Rev. Pl. Vasc. Filip. 256 (1886).

Conocephalus grandifolius Warb. in Perkins, Frag. Fl. Philipp. 167 (1904); Merr. l.c. 71.

Conocephalus warburghii Elmer, Leaf. Philipp. Bot. **1**: 278 (1908).

Conocephalus diffusus Merr. Philipp. J. Sci. **9**: 355 (1914) et Enum. Philipp. Fl. Pl. **2**: 70 (1923), incl. vars.

Conocephalus mollis Merr. Philipp. J. Sci. **18**: 51 (1921) et Enum. Philipp. Fl. Pl. **2**: 71 (1923).

Conocephalus grandis (Wedd.) Merr. Enum. Philipp. Fl. Pl. **2**: 70 (1923).

Poikilospermum diffusum (Merr.) Merr. Contr. Arnold Arbor. **8**: 49 (1934).

Poikilospermum grande (Wedd.) Merr. l.c. 50.

Poikilospermum grandifolium (Warb.) Merr. l.c. 50.

Poikilospermum molle (Merr.) Merr. l.c. 51.

Poikilospermum warburghii (Elmer) Merr. l.c. 52.

TYPE SPECIMENS:—*C. acuminatus* Trec.: Cuming 755, Philippine (Holotype: P; isotypes: C, CGE, FI, G & LE). —*P. grandis* Wedd.: Cuming 1730, Samar (Isotype: BM). —*C. grandifolius* Warb.: Haenke s.n., Luzon, Philippines, 24 Mai 1897 (Holotype: B).—*C. warburghii* Elmer: Elmer 8973, Baguio, Luzon, Philippines, March 1907 (Isotypes: FI & G).—*C. diffusus* Merr.: Wenzel 857, Leyte, Buena-vista, Philippines, 6 June 1914 (Isotypes: BM & G). — *C. mollis* Merr.: Ramos Bur. Sci. 17582, Samar, Ambalete, Philippines, 7 April 1914 (Isotype: K).

Twigs 0.5–1 cm. diam.; periderm lightly fissured, not splitting into sheets or small copper-brown flakes; glabrous to lightly pubescent; stipular-scars quite prominent; grey-white in dry state. *Lamina* 15–25 cm. long, 7–16 cm. broad; ovate, broad ovate to rhombic, very rarely elliptic; quite coriaceous; glabrous to dense hairy; base

cuneate, round to profound cordate; apex sharp acuminate; lateral veins straight, 9–11 pairs, basal pair usually prominent; intercostals numerous, straight, quite distinct. *Petioles* 4–9 cm. long, quite thin; periderm not splitting, smooth, often with visible cystoliths; glabrous to fairly dense hairy. *Stipules* 2.5–5 cm. long; strongly crescentic, coriaceous, very rarely woody; glabrous, very rarely hairy; often very persistent. *Male inflorescences* often to as much as 20 cm. across, very widespread; solitary; branched dichotomously 8–9 times; primary peduncles 2–4 cm. long, secondary ones as long or sometimes longer; peduncular bracts early caducous, bract scars prominent; floral agglomerations 2–3 mm. diam., very numerous in each inflorescence; solitary terminal flowers present at the axils of ultimate dichotomies. *Female inflorescences* similarly ramified, as widespread as the males; floral agglomerations also very numerous, each 0.2–0.3 cm. diam.; peduncles as long as those of the males; peduncular bracts also caducous, leaving prominent scars; solitary terminal flowers absent from the ultimate dichotomies; branches of peduncles puberulous. *Male flowers* sessile, 1–1.25 mm. long, 0.75–1 mm. broad; lightly pubescent; perianth with 4 tepals, incurved at the apex; stamens usually 4, filaments slightly inflexed at the apex; pistillode ca. 1.25 mm. long, transparent and columnar; interfloral bracts very minute. *Female flowers* sessile; 0.75–1 mm. long; perianth lightly pubescent, 4-toothed; ovary 0.5–0.75 mm. long; stigma oblique-capitate, brush-like; interfloral bracts very minute. *Achenes* 1–2 mm. long, 0.5–1 mm. broad; with the persistent perianth at the base as a small cup.

ECOLOGY: This species is apparently widespread in the lowland rain forests of the Philippine Islands, and may even be found at altitudes of 1,500 metres. Many collections had been made from secondary forests while Merrill (1923) had recorded its occurrence in the mossy forests on higher mountains. Most collectors seemed to have found these plants growing in damp habitats.

ECONOMIC USES: Apart from some records of potable water having been obtained from cut stems, these plants seem to have neither commercial nor other uses.

VERNACULAR NAMES: Anapul Anopal, Anopo, Bukol, Hanopol, Himbabalud, Opol and Pongau (Philippines).

As apparent from the synonymy, five species have been reduced into this species. These had all been described from Philippine materials.

Trecul, who first applied the specific epithet *acuminatus* to this species, based it on a specimen collected by Cuming from Manila; and this specimen was cited by him as "Cuming 775" in the original description. After having seen the holotype at Paris, and having checked it with Vidal's "*Phanerogamie Cumingianae* . . .", I realised that Trecul made an error in his type citation. It should have been "Cuming 755".

Procris grandis was described by Weddell in 1856. In 1923, Merrill succeeded in tracing the type specimen of this binomial; he claimed that the type is actually a collection of Cuming from the Philippines and that Weddell made an error by stating that it was a New Guinea plant. Merrill further claimed that it was actually a species of *Conocephalus*; he therefore combined it to *C. grandis*. This was then brought to *Poikilospermum grande* in 1934 when he transferred all species of *Conocephalus* to *Poikilospermum*. I have studied this collection of Cuming at the British Museum and have found it to belong to Trecul's *acuminatum*.

This species *acuminatum* is very distinct. In all the others of the genus, solitary terminal flowers are either present in both sexes or totally absent. In this species, only the males have such terminal flowers and not the females. Vegetatively, this species is very variable. Its lamina may be rhombic, ovate to profound cordate. It may be entirely glabrous to dense pubescent. It is this variability that causes the creation of many "bad" species. For instance, Warburgh's *grandifolius* was based on a plant with large profound cordate lamina. Merrill's *mollis* was certainly the most hairy one of this species.

Winkler (1922) was the first botanist to have realised the intermediate nature of this species between the two subgenera of this genus. The following are the intermediate characters:

- (a) Flowers neither in large fleshy capitula (subgen. *Ligulistigma*), nor borne freely (subgen. *Poikilospermum*); but on very minute peduncular receptacles.
- (b) Filaments only slightly inflexed at the apex.
- (c) Stigmas neither ligulate, nor peltate-capitate; but oblique-capitate

Nevertheless, this species is placed within the subgenus *Poikilospermum* in view of the following characters which are more in accord with it:

- (a) The presence of solitary terminal flowers in the male inflorescences.
- (b) Achenes not wholly enclosed by the persistent perianth.
- (c) The stigmas, though differing from the ordinary very peltate-capitate ones of subgenus *Poikilospermum*, are after all just capitate as opposed to ligulate.

DISTRIBUTION: Philippine Islands

Philippine Islands: *Backer* 3508, Mt. Malailing, 1 June 1914 (SING).—*Clemens* 16590, Mt. Moises, Isabela, Luzon, April 1926 (BM & SING).—*Convocar* PNH 2821, Mt. Isarog, Camarines, Luzon, June 1947 (PNH).—*Cuming* 755 (C, CGE, FI, G, LE & P); 1730, Samar (BM).—*Edano* PNH. 34492, Mt. Malinao,

Albay, Luzon, 27 Jan. 1956 (BR, L & PNH); 79378, Mt. Mapolapola, Camiguin Island, Babuyan, April 1930 (BO & SING).—*Edano & Gutierrez PNH*. 38498, Mt. Bulusan, Sorsogon, Luzon, May 1957 (L).—*Elmer* 6079, Baguio, Luzon (P); 7832, Tayabas, Luzon, May 1907 (FI & G); 8725, Benguet, Baguio, Luzon, March 1907 (FI & G); 8973, Baguio, Luzon, March 1907 (FI & G); 9227, Tayabas, Luzon, May 1907 (FI & G); 15296, Sorsogon, Luzon, Dec. 1915 (C, FI, G & P); 16275, Sorsogon, Luzon, June 1916 (C, FI, G & P); 17512, Mt. Maquiling, Laguna, Luzon, June-July 1917 (BM, C, FI, G & P); 17720, Laguna, Luzon, June-July 1917 (C, FI, G & P); 22002, Mt. Pinatubo, Pampanga, Luzon, May 1927 (BO, C, G, P & SING).

Fenix 12627, Benguet, Luzon, Nov-Dec. 1910 (C & P); 28269, Apayao, Luzon, May 1917 (K & P).—*Haenke s.n.*, Luzon, 24 Mai 1897 (B).—*Loher* 6910 (M); 6920 (M).—*Mendoza PNH*. 18161, Mayan Volcano, Albay, Luzon, 28 May 1953 (L).—*Mendoza & Convozar PNH*. 10485, Mt. Kabatuan, Surigao, Mindanao, 21 March 1949 (PNH).—*Merrill* 1710, Benguet, Luzon, May 1914 (BM, G, P & SING); 7656, Benguet, Luzon, May 1911 (BM & P).—*Oro* 30803, Kinatakutan, Tayabas, Luzon, Jan. 1929 (SING).—*Paniza PNH*. 9390, Mt. Upao, Capiz, Panay Island, 6 March 1949 (PNH).—*Ramos Bur. Sci.* 17582, Samar, Ambalete, 7 April 1914 (K); 20585, Luzon, Feb. 1913 (P); 23714, Sorsogon, Luzon, July-Aug. 1915 (P); 41588, Cabalian, Leyte, Dec. 1922 (B & P); 76738, Penablanca, Cagayan, Luzon, March-May 1929 (SING); 77005, Mt. Dos Cuernos, Cagayan, Luzon, April 1929 (SING).—*Ramos & Edano* 28488, Tayabas, Luzon, May 1917 (P); 31284, Capize, Panay, April-May 1918 (P); 45714, Mt. Alzapan, Tayabas, Luzon, May-June 1925 (B & P).—*Robinson* 11979, Baguio, Benguet, Luzon, May 1911 (BM & K).—*Sinclair & Edano* 9584, Lake Bulusan, Sorsogon, 16 June 1958 (L).—*Sulit PNH*. 3641, Mt. Bulusan, Sorsogon, Luzon, 31 July 1947 (BR & PNH); *PNH*. 7044, Mt. Kakiling, Laguna, 17 May 1947 (L & PNH); *PNH*. 14343, Mt. Cansayao, Catarman, Samar, 3 April 1951 (L & PNH).—*Vanoverbergh* 2739, Bontoc, Luzon, March 1913 (P).—*Wenzel* 176, Leyte, 17 June 1913 (G); 857, Leyte, 6 June 1914 (BM & G); 908, Leyte, 20 June 1914 (BM & G).

2. *Poikilospermum amboinense* Zipp. ex Miq. Ann. Mus. Bot. Lugd.-Bat. **1**: 203 (1864); Merr. Contr. Arnold Arbor. **8**: 48 (1934).

Funis muraenarum latifolius Rumph. Herb. Amb. **5**: 68. t. 36 (1750).

Conocephalus amboinensis (Zipp. ex Miq.) Warb. Bot. Jahrb. **18**: 189 (1894); Schum. & Lauterb. Fl. deutsch. Schutzgeb. Sudsee, 289 (1901); Barg.-Petr. Nuovo G. Bot. Ital. n. ser.

9: 227 (1902); Merr. Interpret. Rumph. Herb. Amb. 199 (1917); Winkl. Bot. Jahrb. 57: 600 (1922), exclud. var. *longifolius*.

Conocephalus papuanus Barg.-Petr. Nuovo G. Bot. Ital. n. ser. 9: 228. t. 13 (1902).

Conocephalus hirsutus Winkl. Bot. Jahrb. 57: 598. t. 14 (1922).

Conocephalus subscaber Winkl. l. c. 599.

Conocephalus gjellerupii Winkl. l. c. 602.

Conocephalus forbesii Moore, J. Bot. Lond. 63: suppl. 112 (1925).

Poikilospermum forbesii (Moore) Merr. Contr. Arnold Arbor. 8: 49 (1934).

Poikilospermum gjellerupii (Winkl.) Merr. l. c. 50

Poikilospermum hirsutum (Winkl.) Merr. l. c. 50.

Poikilospermum subscaber (Winkl.) Merr. l. c. 52.

TYPE SPECIMENS:—*P. amboinense* Zipp. ex Miq.: *Zippeilus* sp. fem., Amboina (lost?).—*C. papuanus* Barg.-Petr.: *Beccari* 73, Kapaor, New Guinea (Holotype: FI).—*C. hirsutus* Winkl.: *Ledermann* 7916, Malu, New Guinea, 1912 (Holotype: B).—*C. subscaber* Winkl.: *Ledermann* 6723, Malu, Sepik, New Guinea, 22 March 1912 (Holotype: B; isotype: SING).—*C. amboinensis* var. *crassus* Winkl.: *Moszkowski* 12, Mamberamo, North New Guinea, 20 May 1910 (Holotype: B).—*C. gjellerupii* Winkl.: *Gjellerup* 203, Begowri, North New Guinea, 24 June 1910 (lost?).—*C. forbesii* Moore: *Forbes* 3257, Paso, Amboina, 1882 (Holotype: BM; isotype: LE).

Twigs 0.5–1.5 cm. diam.; smooth to very rough lenticellate; generally glabrous, young ones light pubescent to long hairy; stipular—and petiolar-scars quite prominent. *Lamina* (10–)15–30 (–40) cm. long, (5–)10–15(–20) cm. broad; elliptic, ovate to broad ovate; coriaceous; generally glabrous, young ones lightly pubescent to dense hairy, especially the abaxial surface; base round to profound cordate, very rarely cuneate; apex usually acuminate, long or short; lateral veins 9–13 pairs, prominent; intercostals generally very prominent and straight; cystoliths on the adaxial surface elongate or punctiform. *Petioles* (2–)5–12(–14) cm. long, 0.3–0.5 cm. broad, generally glabrous, smooth, young ones usually pubescent to long rough hairy. *Stipules* 3–7 cm. long, usually straight; glabrous, young ones often lightly pubescent, very rarely rough hairy; persistent to caducous. *Male inflorescences* 2–10 cm. long, 2–20 cm. broad; solitary; branched dichotomously many times; peduncular branches thick, not flimsy, primary ones short to very

long, secondary ones usually longer, glabrous to dense canescent; peduncular bracts persistent to early caducous, very large and foliaceous to small; floral agglomerations with more than five flowers each. *Female inflorescences* about same dimensions as the male; solitary; branched dichotomously many times; peduncular branches thick, primary and secondary ones about the same length; indument same as the male; peduncular bracts small to as long as 2 cm., persistent to caducous; floral agglomerations with 3 to 5 flowers each, rarely more. *Male flowers* sessile, rarely subsessile; 1–1.5 mm. long, 0.75–1 mm. broad; perianth generally glabrous, rarely pubescent or canescent; tepals 4, equal sized, slightly gamophyllous at the base; stamens 4, rarely 3 or 2; filaments narrow, rarely broad; inflexed in the bud; pistillode slightly smaller than perianth, variable in shape; interfloral bracts very minute, often totally absent. *Female flowers* sessile to subsessile; ca. 1 mm. long; perianth generally glabrous, very rarely pubescent; minutely 4-toothed; ovary slightly shorter than perianth; stigma peltate-capitate, usually brush-like; interfloral bracts very minute. *Achenes* ca. 2 mm. long, half as broad; with persistent perianth at the base.

ECOLOGY: This species seems to be quite common in riverine forests or close to water courses. It occurs from sea-level to as high as 550 metres (van Royen).

VERNACULAR NAMES: Aideka, Ipoer, Sehpoka and Wali (New Guinea).

This is a very variable species. Nevertheless, Zippelius' description which was published by Miquel, is so clear that there is little difficulty in identifying the specimens cited below as belonging to this species.

The species *papuanus*, described by Bargagli-Petrucci, was claimed by him to be different from *amboinense* in the more elongated lamina and the wider bracts of the female inflorescences. It is now found that in *amboinense* the lamina and peduncular bracts vary greatly in size and shape. Bargagli-Petrucci's *papuanus* is indistinguishable from *amboinense*.

The other three species considered conspecific with *amboinense* were described by Winkler from New Guinea. He delimited them mainly on hairs. As *amboinense* has now been found to vary greatly from glabrous to dense hairy, Winkler's species, *hirsutus*, *subscaber* and *gjellerupii*, are therefore considered conspecific with *amboinense*.

Regarding the species *forbesii*, Moore, the author, noted that it is nearest to *oblongifolium* which is a species of subgenus *Ligulistigma*. What he actually had was a collection of this species *amboinense*.

DISTRIBUTION: Moluccas, New Guinea and Bismarck Archip.

Moluccas: *Buwalda* 5663, Kp. Kiandorat, G. Kilia, East Ceram, 19 Aug. 1938 (BO, L, LAE & SING).—*Eyma* 2637, Riring-Batoe, West Ceram, 18/19 Jan. 1938 (BO, L & SING); 2795, Wae Toebe, West Ceram, 4 Feb. 1938 (BO & L); 3219, Loa Div. 1, G. Loa, West Ceram, 7 April 1938 (BO).—*Forbes* 3257, Paso, Amboyna, 1882 (BM & LE); 3272, Amboyna, 1882 (BM).—*Kornassi (exp. Rutten)* 1138, Ambon, 15 April 1918 (B).—*Riedel Com. per Dr. Meyer* 11/82, Buru (K).—*Robinson* 170, Amboyna, July/Nov. 1913 (BM & P); 172, Amboyna, July/Nov. 1913 (P & SING).—*Smith* 202, Honimoa, Ceram, 1797 (?) (BM).

New Guinea: *Aet* 307, Sg. Si-era, 19 June 1941 (BO, L & SING).—*Aet & Idjan* 808, Jappen, Biak, 16 Sept. 1939 (L).—*Beccari* 73, Kapaor, Papua, April 1872 (FI); 173, Sorong, 1872 (FI).—*Brass* 25601, Lebudowa River, Normandy Island, 26 April 1956 (L); 28613, Kulumadan, Woodlark Isl., 4 Nov. 1956 (L); 28937, Modewa Bay, 20 Dec. 1956 (L).—*Carr* 16207, Kokoda, 23 March 1936 (L); 16419, Kokoda, 17 April 1936 (L & SING).—*Forbes* 685, Sogeri Region, 1885/1886 (BM & LE).—*Gjellerup s.n.* (BO).—*Gray & Floyd* 8070, Seribi River, 20 July 1955 (L).

Hoogland 3284, Amboga River, 11 July 1953 (L); 3633, Patkiari Village, 15 Aug. 1953 (L).—*Kalkman* 3523, Manowani, 13 June 1956 (L).—*Kanehira & Hatusima* 11422, Nabire, Geelvink Bay, 23 Feb. 1940 (BO); 13413, Momi, Manokwari, 3 April 1940 (BO).—*Kostermans* 2648, Warnapi, Vogelkop, 23 July 1948 (L); 2788, Momi, Vogelkop, 16 Aug. 1948 (BO, K & L).—*Lam* 404, Mamberamo, 26 June 1920 (U); 647, Mamberamo, 17 July 1920 (U); 983, Mamberamo, 31 Aug. 1920 (U).—*Ledermann* 6723, Sepik, Malu, 22 March 1912 (B & SING); 7916, sine loc., 1912/1913 (B).—*van Leeuwen* 9308, sine loc., May 1926 (BO); 10173, Rouffaer River, Aug. 1926 (K & U); 11333, Mamberamo, Albatross Bivak, Nov. 1926 (K & U); 11374, Mamberamo, Nov. 1926 (K & U); 11383, Mamberamo, Nov. 1926 (U).

Meijer-Drees 526, Koode River, Aug. 1938 (L).—*Moszkowski* 12, sine loc., 18 Oct. 1910 (B).—*Pleyte* 513, Kadamak, Sorong, 11 Aug. 1948 (BO, L & SING).—*Pulsford & Floyd* 5411, Dagua, Sepik, 17 Oct. 1953 (BO, L & SING).—*Romer* 542, sine loc., 14 Oct. 1909 (BO).—*Royen* 3446, Steenkool, 23 April 1954 (L); 4943, Kebar Valley, Api River, 5 Nov. 1954 (L); 5282, sine loc. (L).—*Thomsen* 696, Mamberamo, 23 April 1914 (U).

Bismarck Archipelago: *Floyd* 6693, Keravat, New Britain, 31 Dec. 1954 (L & SING).

3. *Poikilospermum inaequale* Chew, spec. nov.

TYPE SPECIMEN: *Floyd & Womersley* 6850, Baiyer River, Western Highlands, Territory of New Guinea, 26 Nov. 1954 (Holotype: L; isotype: LAE).—**Fig. 17.**

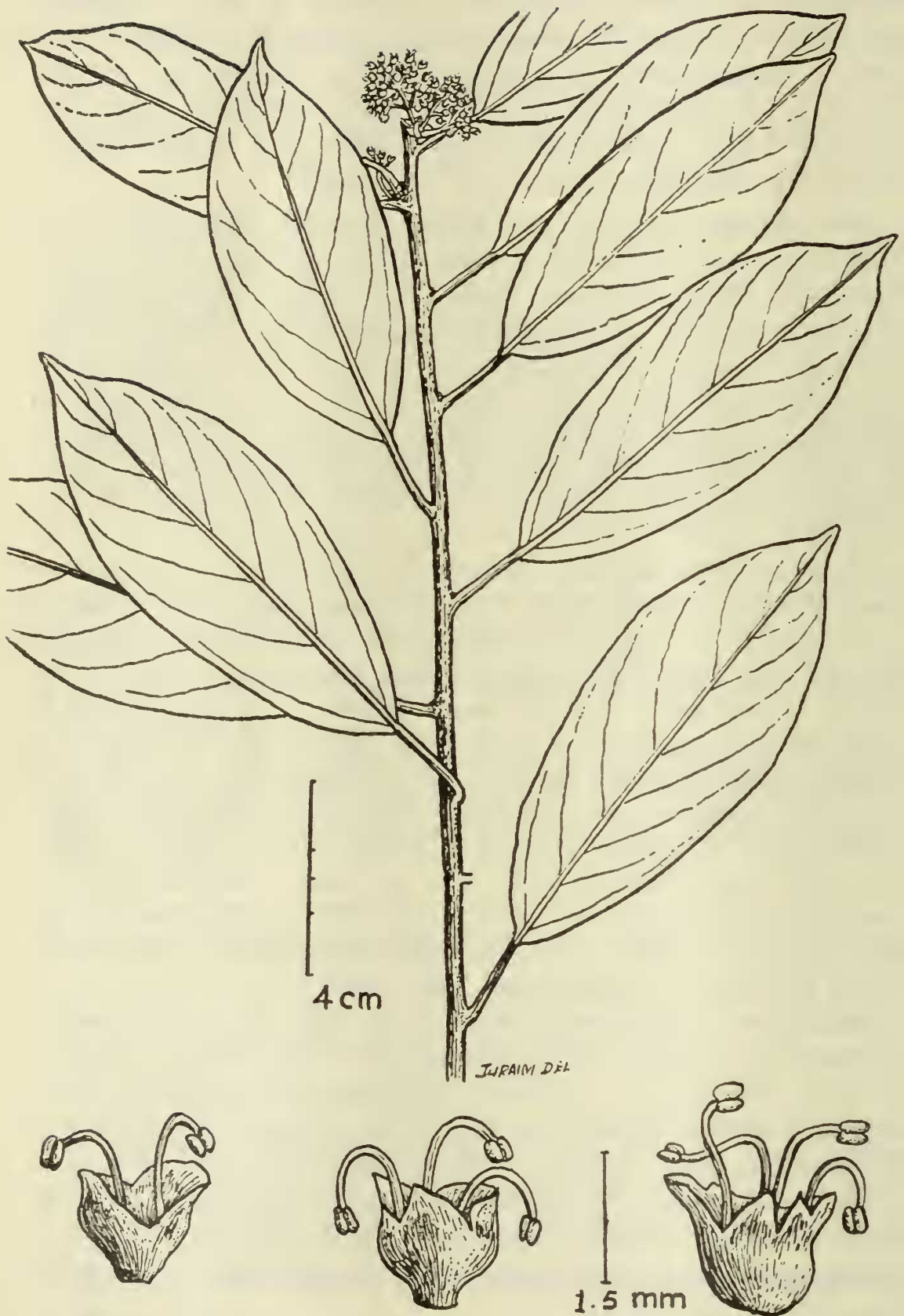


Fig. 17. *Poikilospermum inaequale*. Male twig. Perianth with 2-5 irregular tepals.

Ramuli 0.3–0.7 cm. diam., sparse vel dense lenticellati; paullum pubescentes, mox glabri; cortice fuscescenti levi, mox fisso; cicatricibus stipularum et petiolarum elevatis. *Laminae* ellipticae, raro late ellipticae; (6–) 8–17 (–20) cm. longae, (2–) 4–8 (–10) cm. latae; basi cuneatae, raro rotundatae; apice acuminatae, acumine ca. 2 cm. longo; glabrae; saepe coriaceae; costis lateralibus utrinsecus (8–) 10–13, subtus aliquanto elevatis; intercostis obscuris. *Petioli* (1–) 2–4 (–6) cm. longi, gracillimi, glabri. *Stipulae* 2–3 cm. longae, erectae, lineares, paullum pubescentes, caducae. *Inflorescentiae masc.* 1–3 cm. $\times$ 1–3 cm., glabrae vel paullum pubescentes, solitariae, geminatae vel complures; bracteis plerumque persistentibus parvis scaphiformibus; ramulis inaequalibus, gracilibus; floribus 1–5 fasciculatis. *Inflorescentiae fem.* latiores, 4–7 cm. $\times$ 4–7 cm.; plerumque paullum pubescentes, solitariae, vel geminatae, rarissime plures; bracteis plerumque persistentibus 0.3–0.6 cm. longis; ramulis aequalibus crassioribus; floribus 1–5, raro pluribus, fasciculatis. *Flores masc.* sessiles, raro subsessiles, plerumque glabri, 1–1.25 mm. longi, ca. 1 mm. lati, bracteolis minutissimis intermixti; perianthio gamophyllo, dein in lacinias 2–5 inaequales fisso; staminibus 4, raro 2 vel 3; pistillodio parvo pellucido. *Flores fem.* sessiles, 1–1.25 mm. longi, ca. 1 mm. lati, glabri; bracteolis minutis tam longis quam parte perianthio quinta; perianthio minutissime 4-denticulato, quam ovario paullum longiori; stigmate crasso peltato-capitato. *Achaenium* ca. 2 mm. longa, 1 mm. lata, e perigonio persistenti semi-exsertum.

ECOLOGY: Most of the collections of this species were from New Guinea Highlands and usually above the 1,000 metre contours, very few being collected below this altitude. It seems to be a common climber in swampy forests.

The main characteristics of this species are found in the male plants. As indicated in the key, this is the only species that has the perianth splitting irregularly at anthesis into unequal parts. Besides, the branches of the peduncle seem to grow at different rates resulting in their unequal lengths at maturity. Hence the epithet *P. inaequale*.

DISTRIBUTION: New Guinea & Bismarck Archipelago.

New Guinea: *Barrett* 4212, Mageni, 10 Aug. 1951 (L).—*Brass* 5450, Bella Vista, 1933 (BO).—*Carr* 12079, Koitaki, 29 April 1935 (L); 13977, Lala River, 24 Dec. 1935 (L & SING); 15167, Isuarava, 4 Feb. 1936 (L & SING); 15632, Isuarava, 18 Feb. 1936 (L & SING); 15728, Isuarava, 24 Feb. 1936 (L & SING); 15931, Isuarava, 4 March 1936 (L & SING); 15936, Isuarava, 4 March 1936 (L & SING).

Clemens 334, Sattelberg, Morobe District, 5 Oct. 1935 (B & L); 612, sine loc., 24 Oct. 1935 (BR); 8291, Boana, Morobe Distri.,

27 May 1938 (B).—*van Leeuwen* 9671, sine loc. (U).—*White et al.* NGF. 1692, sine loc. (LAE).—*Womersley & Floyd* 6804. Western Highlands (L).

New Britain: *Floyd* 6559, Malalia, 18 Aug. 1954 (L).

4. ***Poikilospermum nobile*** (Ridl.) Merr. Contr. Arnold Arbor. **8**: 51 (1934).

Conocephalus nobilis Ridl. Trans. Linn. Soc. Bot. **9**: 150 (1916).

Conocephalus albiflora Ridl., nom. nud. in herb.

TYPE SPECIMEN:—*C. nobilis* Ridl. (1916): *Boden-Kloss s.n.*, Camp I, Dutch New Guinea, 1912–1913 (Holotype: BM).—**Fig. 18.**

Twigs unknown. *Lamina* obovate, very large, to 70 cm. long, ca. 25 cm. broad; glabrous throughout; very coriaceous; base broad cuneate; apex short acuminate, or cuspidate; lateral veins more than 18 pairs, all curving towards the apex, very prominent; intercostals very numerous, straight and closely set. *Petioles* 4–20 cm. long, ca. 0.3 cm. broad, smooth and glabrous. *Stipules* unknown. *Male inflorescences* 5 cm. long, 9 cm. broad; solitary; branched dichotomously many times, peduncular branches very short and thick, hence inflorescences very congested; primary peduncles ca. 4 mm. long; all covered with long white hairs; peduncular bracts ca. 1.5 cm. long, foliaceous, persistent. *Male flowers* sessile to slightly subsessile; 1.5 mm. long, half as broad; perianth lightly pubescent at the apex; tepals 4, slightly gamophyllous at the base; stamens 4; filaments as broad as the tepals; pistillode ca. 1 mm. long, transparent, fleshy, broad obpyramidal; interfloral bracts almost absent.

This species is known only from two collections from the Dutch part of South New Guinea; and these collections are still well preserved at the British Museum. Ridley, the author, named the two specimens *C. albiflora*, but in his publication he somehow changed his mind and named them *nobilis*.

Despite the paucity of collections, this species seems to be quite distinct. The shape and venation of lamina of this species is very different from those of all the New Guinea collections I have examined. Besides, this is the only species in the subgenus *Poikilospermum* to have filaments as broad as the tepals.

DISTRIBUTION: New Guinea.

New Guinea: *Boden-Kloss s.n.*, Camp I, Dutch New Guinea, 1912–1913 (BM); *s.n.*, Canoe Camp, Dutch New Guinea, 1912–1913 (Paratype: BM).

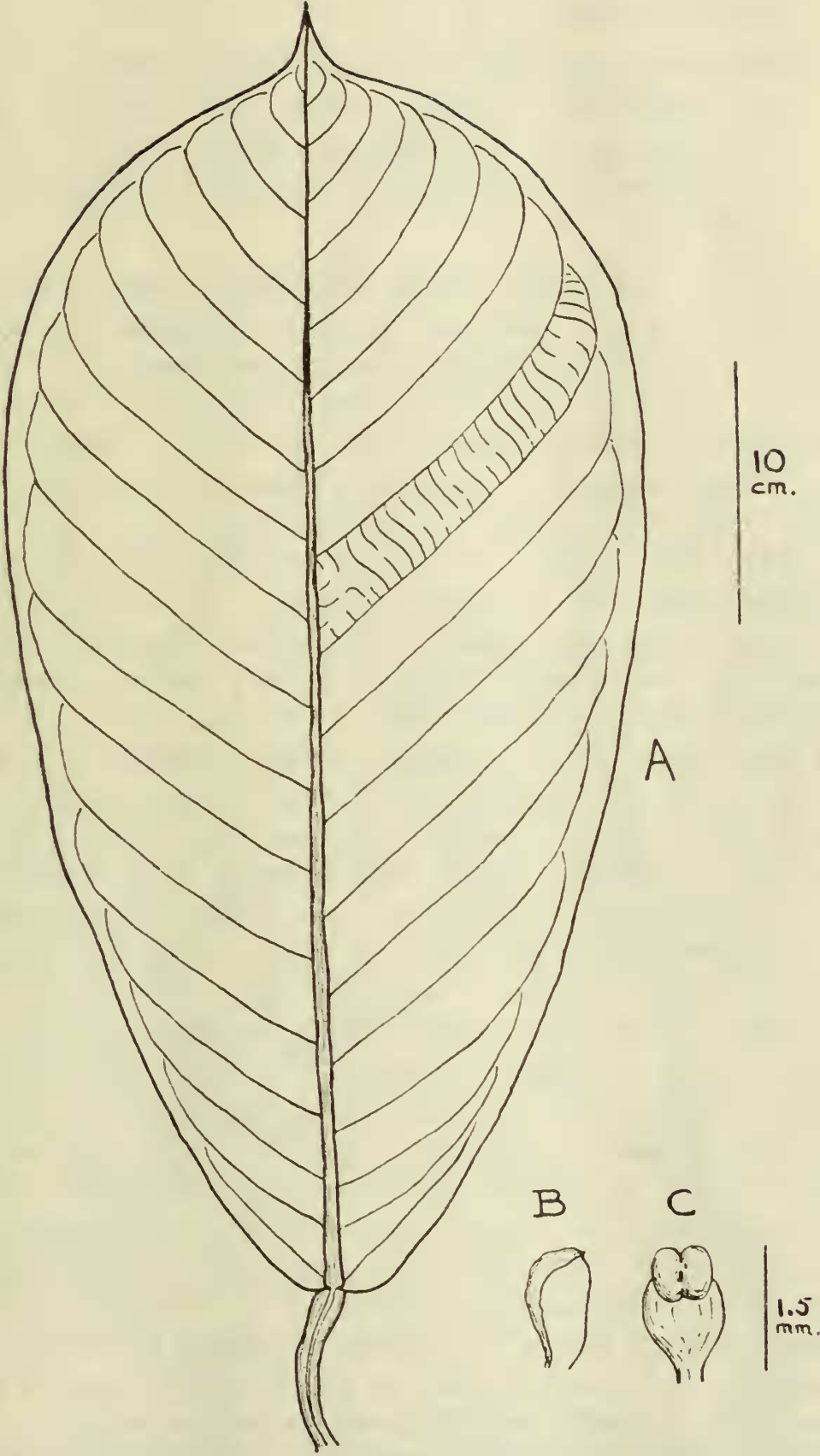


Fig 18. *Poikilospermum nobile*. A, lamina. B, tepal. C, stamen.

5. **Poikilospermum paxianum** (Winkl.) Merr. Contr. Arnold Arbor. 8: 51 (1934).

Conocephalus paxianus Winkl. Bot. Jahrb. 57: 602 (1922).

Conocephalus amboinensis var. *longifolius* Winkl. Bot. Jahrb. 57: 601 (1922).

TYPE SPECIMENS:—*C. paxianus* Winkl. (1922): *Gjellerup* 193, Nordl. New Guinea, 24 June 1910 (Holotype lost?).

—*C. amboinensis* var. *longifolius* Winkl. (1922): *Versteeg* 1779, Sudwestl. Neu-Guinea, 1 June 1907 (Holotype lost?).

—Fig. 19.

Twigs 0.5–1 cm. diam.; rough lenticellate, young ones often dense canescent, soon glabrous; brown to dirty-grey coloured in dry state; stipular- and petiolar-scars scarcely prominent. *Lamina* 20–40 cm. long, 8–16 cm. broad; ovate to long elliptic; coriaceous; adaxial surface sparse canescent on the veins, abaxial surface usually densely canescent; base broad cuneate to round, very rarely cordate; apex short, abrupt acuminate; lateral veins (13–)15–18 pairs, prominent, closely set, curving towards apex; intercostals numerous, closely set, prominent. *Petioles* 5–12 cm. long, ca. 0.3 cm. broad, young ones lightly to very thick canescent. *Stipules* 3–7 cm. long; quite straight; lightly to densely canescent, especially young ones; often persistent. *Male inflorescences* ca. 4 cm. long, ca. 4 cm. broad; usually solitary; primary peduncles ca. 2 cm. long, secondary ones shorter; all branches rather canescent; peduncular bracts large, persistent, quite canescent; floral agglomerations fairly compact. *Female inflorescences* more wide-spread than the males; ca. 5 cm. long, ca. 7 cm. broad; solitary; primary and secondary peduncles about the same length; all branches glabrous to light canescent; peduncular bracts ca. 0.5 cm. long; floral agglomerations wide-spread. *Male flowers* pedicellate; perianth ca. 1 mm. long; glabrous; tepals 4, slightly gamophyllous at the base; stamens 4, rarely 3; filaments narrow to broad; pistillode small, obpyramidal, transparent; interfloral bracts very minute; pedicels as long as perianth, glabrous to light pubescent. *Female flowers* pedicellate; ca. 1 mm. long, half or less as broad; perianth glabrous, minutely 4-toothed; ovary slightly shorter than perianth; stigma thick peltate-capitate; pedicels 1–1.25 mm. long, rarely shorter; interfloral bracts ca. one-fifth the length of the perianth. *Achenes* ca. 2–3 mm. long, half as broad; greatly exserted from the persistent perianth; pedicel almost as long as achene.

Winkler's description of this species is so detailed that there is no difficulty in equating with it the collections cited below. The most important character that distinguishes it from the others of the subgenus *Poikilospermum* is the presence of distinct pedicels. Besides, the number of lateral veins of the lamina is also quite characteristic.

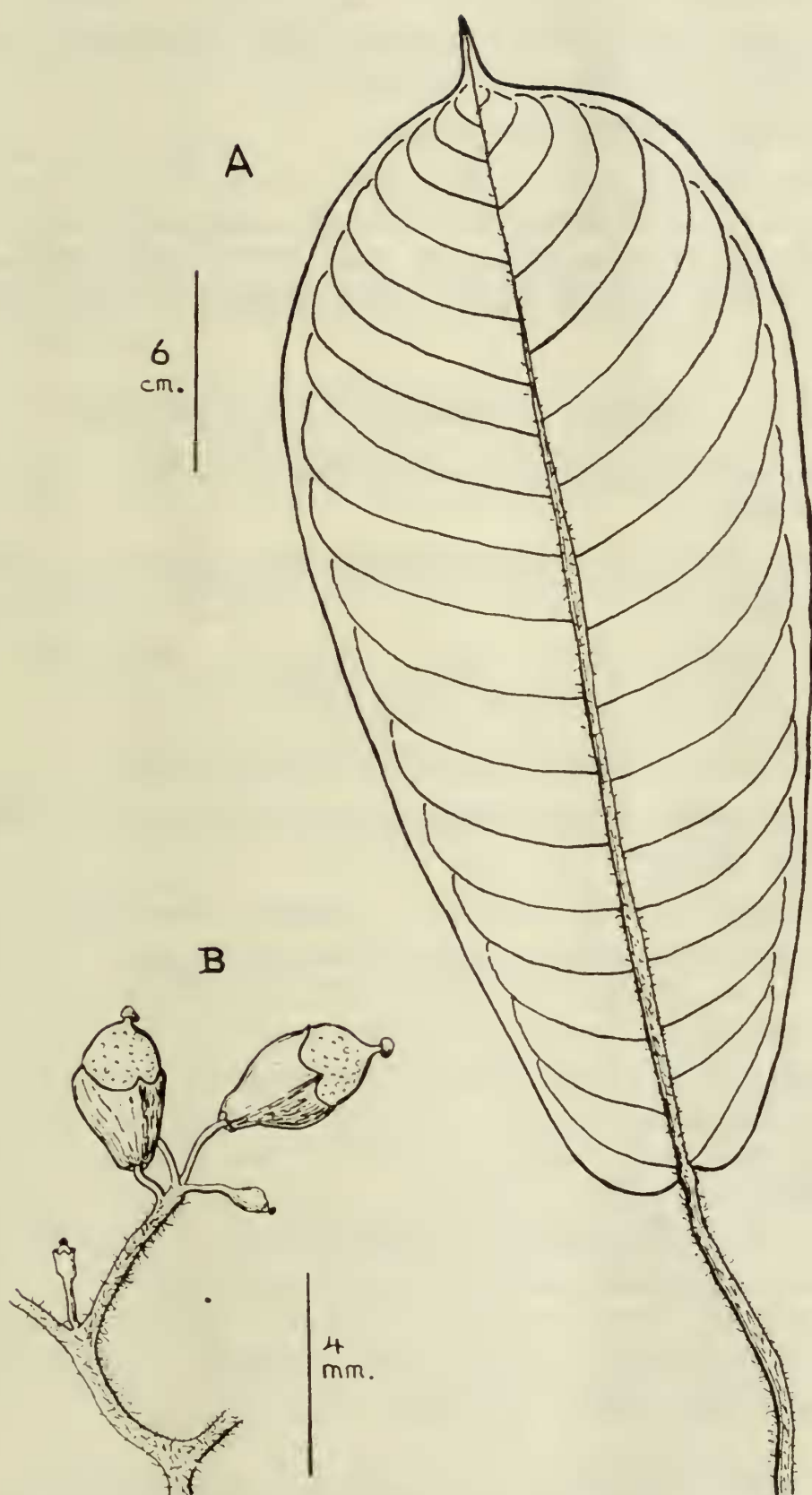


Fig. 19. *Poikilospermum paxianum*. A, lamina. B, young and matured female flowers.

Winkler noted that this species is nearest to his own *C. hirsutus* (= *P. amboinense*) and that they differ in the hairiness of the lamina as well as in the size of inflorescences. He obviously overlooked the most important character which is now made use of.

As for his *C. amboinensis* var. *longifolius*, the description is so very similar to that of *P. paxianum* that I cannot help regarding this variety the same as *paxianum*.

DISTRIBUTION: New Guinea.

New Guinea: *Brass* 6744, Papua, May 1936 (L).—*Gray & Floyd* 8071, Seribi River, Gulf Division, Papua, 20 July 1955 (L).—*Lam* 950, Pranwenbivak, 29 Aug. 1920 (BO).—*Pullen* 1384, Balek Creek, Ninihok Valley, Sepik District, 30 July 1959 (L).

Subgenus *Ligulistigma* Chew, nom. nov.

Balansaephytum (genus) Drake, Bull. Soc. Bot. France **43**: 83 (1896).

Conocephalopsis (genus) Kuntze, Rev. Gen. Pl. **3** (2): 136 (1898).

Conocephalus group *Diandroconocephalus* Barg.-Petr. Nuovo G. Bot. Ital. n. ser. **9**: 216 (1902).

Conocephalus group *Euconocephalus* Barg.-Petr. l. c.

Conocephalus subgen. *Euconocephalus* Winkl. Bot. Jahrb. **57**: 595 (1922).

Periderm of twigs smooth or splitting into lenticellate sheets or copper-brown flakes. *Stipules* usually crescentic. *Male inflorescences* with flowers on swollen peduncular receptacles; solitary terminal flowers absent; peduncular bracts usually paired, small to large and foliaceous. *Female inflorescences* same as the males except with more flowers in each floral capitulum. *Male flowers* sessile; filaments of stamens straight. *Female flowers* pedicellate, sometimes very long pedicellate; perianth 4-lobed; perianth lobes 2 + 2 decussate-imbricate; stigma ligulate. *Achenes* at maturity almost totally enclosed by the persistent perianth.

DISTRIBUTION: Plants of the South-east part of Continental Asia, the Philippine Islands and Western Malaysia; rare in Southern and Eastern Malaysia.

KEY TO SPECIES OF SUBGEN. LIGULISTIGMA

1. a. Inflorescences not repeatedly dichotomous; male floral capitula 2, or if numerous, then arranged in two pseudo-umbellate groups; female floral capitula medium-sized to very large, 2 to 4 in number, very rarely more 2.
- b. Inflorescences repeatedly dichotomous; male floral capitula very numerous, usually wide spread; female capitula usually small-sized often 8 to many in each inflorescence. 8.

2. a. Male and female capitula 2 in each inflorescence; Male inflorescences 2 to 5 at each leaf axil; peduncles of both sexes very thin and filiform; lamina large oblanceolate, apex long acuminate; basal pair of lateral veins extremely prominent; stipules persistent, very chartaceous; dried leaves light brown coloured.

(11) *P. microstachys*.

- b. Male and female capitula more than 2 in each inflorescence; male ones solitary at each leaf axil with capitula arranged in 2 pseudo-umbellate groups; peduncles usually stout and not thin or filiform; lamina ovate, elliptic, oblong or even obovate; stipules caducous, if persistent usually very woody; dried leaves very rarely light brown. 3.
3. a. Female flowers subsessile to very short pedicellate; tertiary peduncles of male inflorescences very short, hence male inflorescences appear 2 to 4 capitulate; achenes broad pear-shaped; periderm of twigs splitting into broad smooth sheets; stipules scale-like and usually early caducous. (20) *P. tangaum*.
- b. Female flowers distinctly pedicellate; tertiary peduncles of male inflorescences longer, hence floral capitula clearly in 2 pseudo-umbellate groups; achenes usually long ellipsoid; periderm of twigs either not splitting or splitting into rough sheets or flakes; stipules usually fairly foliaceous. 4.
4. a. Pedicels of female flowers not elongating at maturity, usually shorter than achenes; periderm of petioles and twigs not splitting, usually roughly ridged; lenticels few, mostly at nodes; lamina long to short acuminate. (13) *P. oblongifolium*.
- b. Pedicels of female flowers elongating greatly at maturity, hence longer than achenes; periderm of twigs and petioles usually splitting into either copper-brown flakes or broad white-greyish sheets; smooth periderm usually in plants with acute-apex lamina. 5.
5. a. Periderm of twigs and petioles not splitting into sheets or flakes; lamina exact ovate, base rounded, apex obtuse, very rarely acute; male inflorescences 4 × 4 cm. overall; female capitula ca. 3 cm. diam.; plants entirely glabrous (6) *P. annamense*.
- b. Periderm of twigs especially, splitting into copper-brown flakes or into broad white-greyish sheets; lamina variable. 6.
6. a. Huge-leaved plants; stems, twigs, petioles of large sizes; periderm splitting into large white-greyish and densely lenticellate sheets; lamina with wavy edges; lateral veins very lax and well-spaced; intercostals prominent only at points of departure from lateral veins, the rest often not visible, quite anastomosing. (8) *P. cordifolium*.
- b. Smaller-leaved plants; stems, twigs, petioles of small to medium size; periderm splitting into copper-brown flakes; lamina with smooth edges; lateral veins not lax, but very rigid and slightly arched; intercostals straight, faint to prominent 7.
7. a. Lamina usually with long acuminate apex, very rarely short acuminate, or even sharp acute, 8 to 14 cm. long; petioles short, ca. 1 to 3.5 cm.; stipules very small, very early caducous; female capitula very rarely exceed 2 cm. diam. at maturity. (19) *P. subtrinervium*.
- b. Lamina commonly with obtuse-apex, very rarely sharp acute, 10 to 40 cm. long; petioles much longer, 4 to 14 cm.; stipules large, usually 2 to 4 cm. long, often persistent; female capitula usually 3 to 7 cm. diam. at maturity (18) *P. suaveolens*.
8. a. Periderm of twigs splitting into small copper-brown flakes, or into large white-greyish densely lenticellate sheets. 9.
- b. Periderm of twigs at most longitudinally ridged, but never splitting into flakes or sheets 13.

9. a. Periderm splitting into large to small, lightly to densely lenticellate sheets; plants of Borneo and the Philippines. 10.
- b. Periderm splitting into small copper-brown flakes, and not like above; plants of Continental Asia and Sumatra. 11.
10. a. Lamina very broad ovate, apex obtuse to acute, abaxial surface usually densely canescent, very rarely glabrous or pubescent, edges of lamina very wavy; lateral veins usually lax and well-spaced; peduncles light to densely canescent; plants of the Philippine Islands. (9) **P. erectum**.
- b. Lamina elliptic or oblong, apex blunt acuminate, abaxial surface glabrous, edges smooth, not wavy; lateral veins not like those of above species; peduncles at most lightly pubescent, often glabrous; plants of Borneo. (20) **P. tangau**.
11. a. Peduncles, abaxial surfaces of lamina, petioles and twigs without white hairs nor red-stellate ones; these parts at most thickly pubescent; male perianth with dense sharp transparent hairs; plants of Continental Asia. (12) **P. naucleiflorum**.
- b. Peduncles, petioles and twigs well covered with white hairs intermixed with red-stellate ones; male perianth at most light pubescent, never with hairs of above species; plant of Sumatra. 12.
12. a. Perianth not elongating at fruit; pedicels of female flowers usually very short, ca. 1 mm., and hence much shorter than perianth; lamina ovate, with 10 to 13 pairs of very straight and parallel lateral veins (17) **P. singalense**.
- b. Perianth elongating to twice or more of the length of achene; pedicels of female flowers usually much longer than perianth or achenes; lamina with 14 to 17 pairs of lateral veins; lateral veins usually arched progressively towards apex of lamina.
(7) **P. azureum**.
13. a. Lamina very broad cordate, peltate, apex very rounded, base usually 7-veined, lateral veins ca. 10 pairs; periderm of twigs very thick; petioles commonly 15 to 20 (to 26 sometimes) cm. long, usually very twine-like. (14) **P. peltatum**.
- b. Lamina variable in shape, but never peltate, apex acute to long acuminate, extremely rarely rounded, base at most 5-veined, usually less; periderm of twigs and petioles not thick; petioles not more than 15 cm. long, or if so, never twine-like but rather rigid 14.
14. a. Peduncular bracts extremely minute, ca. 0.2 cm. long, persistent, paired, often solitary; female perianth often very broad at apex, hence inverted pear-shaped; lamina lanceolate to diamond-shaped; lateral veins 11–12 pairs; plants of Continental Asia.
(10) **P. lanceolatum**.
- b. Peduncular bracts much larger than 0.2 cm., persistent to caducous, always paired; female perianth narrower, usually campanulate; lamina elliptic to broad cordate; lateral veins 7 to 14 pairs; plants of Western Malaysia 15.
15. a. Petioles 1 to 2.5 cm. long, usually ca. 2 cm. long, i.e. very short compared to lamina length; lamina generally elliptical; twigs very smooth and straight with very prominent stipular—and petiolar—scars, hence twigs bamboo-like in appearance; male inflorescences very greatly ramified, floral capitula very numerous, and at anthesis, white-dotted in appearance; peduncular bracts very early caducous; plants entirely glabrous (16) **P. scortechinii**.
- b. Petioles much longer, at least (and very rarely) 3 cm. long; lamina oblong to broad cordate, very rarely elliptic; twigs very rough with lenticels, very rarely straight, not bamboo-like at all; male inflorescences less ramified, floral capitula not like those of above species; peduncular bracts persistent, very rarely caducous; plants pubescent only on young parts, soon glabrous.
(15) **P. scabrinervium**.

6. **Poikilospermum annamense** (Gagnep.) Merr. Contr. Arnold Arbor. 8: 49 (1934).

Conocephalus annamensis Gagnep. in Lecomte, Fl. Gen. Indo-Chine 5: 832. t. 96, 1-10 (1929).

TYPE SPECIMEN:—*C. annamensis* Gagnep.: Poilane 8280, Route de Nhatrang, Ninh-Hoa, Annam, 18 Oct. 1923 (Lectotype: P).

Twigs ca. 0.7 cm. diam., periderm not splitting longitudinally, but never into flakes; rough, with numerous prominent lenticels; glabrous; stipular- and petiolar-scars often very prominent; dark brownish in dry state. *Lamina* 10-22 cm. long, 5-14 cm. broad; ovate, broad or narrow; coriaceous; glabrous; base broad cuneate to round; apex obtuse, very rarely acute; lateral veins ca. 11 pairs, very straight, parallel and very prominent on abaxial surface; intercostals numerous, straight, fairly prominent. *Petioles* 2-5 cm. long, ca. 0.3 cm. diam; periderm smooth, not splitting into flakes; glabrous throughout. *Stipules* 1-2 cm. long, glabrous, slightly woody, slightly curved, early caducous. *Male inflorescences* ca. 4 cm. long, 4 cm. broad; solitary; branched dichotomously 2-3 times, rarely more; primary and secondary peduncles about the same length, ca. 2 cm. long, tertiary and later branches very numerous, all about the same length, very short, hence the capitula arranged in 2 umbel-like groups; all branches glabrous; peduncular bracts ca. 1 cm. long, prominently boat-shaped, glabrous, early caducous; floral capitula ca. 0.5 cm. diam., very numerous. *Female inflorescences* 4 cm. long, 6 cm. broad; solitary; dichotomously branched once; primary peduncle ca. 1 cm. long, secondary ones slightly longer; glabrous; peduncular bracts paired, early caducous; floral capitula ca. 3 cm. diam., 2 in each inflorescence. *Male flowers* sessile; ca. 2 mm. long, half as broad; perianth lightly to densely pubescent; tepals 4, incurved at apex; stamens 4, rarely less, slightly shorter than the perianth; filaments short, straight; rudimentary ovary ca. 1.5 mm. long, peltate-capitate at the apex. *Female flowers* pedicellate; perianth 3-4 mm. long, ca. 1 mm. broad, 4-lobed, tepals pubescent; ovary slightly shorter than perianth; stigma ca. 1 mm. long; pedicel 7-10 mm. long. *Achenes* ca. 3-4 mm. long, ca. 1 mm. broad; covered by persistent perianth; pedicel elongating greatly.

ECOLOGY: According to Poilane's field notes, this species seems to be a highland one of Indo-China, occurring from 500 to 900 metres above sea level.

VERNACULAR NAME: Rum (Indo-Chinese).

Gagnepain cited three collections of Poilane as types without any indication as to which one his description was based upon. My choice of the above specimen as a lectotype is mainly based on the present condition of the specimens since his description certainly covers all these collections very well.

This species is very close to *P. suaveolens*. It differs from the latter in having smooth and unsplit periderm. Besides, these specimens seem to indicate that this species is quite frail in nature.

DISTRIBUTION: Indo-China.

Poilane 8280, Route de Nhatrang, Ninh-hoa, Annam, 18 Oct. 1923 (Lectotype: P); 8323, same locality, 19 Oct. 1923 (P) and 9972, Ka Rom prov., Phanrang, 7 March 1924 (P).

7. **Poikilospermum azureum** (Teysm. & Binn.) Merr. Contr. Arnold Arbor. 8: 49 (1934).

Conocephalus azureus Teysm. & Binn. Nat. Tijdschr. Ned. Ind. 27: 26 (1864); Barg.-Petr. Nuovo G. Bot. Ital. n. ser. 9: 229 (1902).

TYPE SPECIMEN:—*C. azureus* Teysm. & Binn.: *Diepenhorst s.n.* Priaman, Sumatra (Holotype lost?).

Twigs 0.7–1.5 cm. diam.; periderm splitting into very numerous copper-brown flakes, densely lenticellate, lenticels of large size; lightly to densely covered with white hairs as well as reddish-stellate ones; petiolar- and stipular-scars usually very prominent; copper-brown in dry state. *Lamina* (18–) 20–30 cm. long, (13–) 15–25 cm. broad; very broad ovate, slightly asymmetrical; very coriaceous; pubescent on abaxial surface; base rounded, truncate to profound cordate; apex obtuse to acute; lateral veins 14–17 pairs, very rigid and prominent, curving progressively towards apex, hence not parallel to each other; intercostals very numerous, rigid and prominent, very closely set. *Petioles* (4–) 10–26 cm. long, 0.3–0.4 cm. broad; periderm splitting into copper-brown flakes, often with large lenticels; with white hairs intermixed with red-stellate ones, especially the basal part. *Stipules* 2–4 cm. long; somewhat crescentic; similarly covered with hairs as petioles and twigs; often caducous. *Male inflorescences* 6–7 cm. long, 7–8 cm. broad; solitary; branched dichotomously many times; primary and secondary peduncles about the same length, ca. 2 cm. long; peduncular branches well covered with hairs similar to those of twigs; peduncular bracts ca. 1 cm. long, broad foliaceous, very rarely small, usually early caducous; floral capitula 0.3–0.5 cm. diam. very numerous. *Female inflorescences* (10–) 13 cm. long, 15–20 cm. broad; solitary; branched dichotomously 3–4 times; primary and secondary peduncles about the same length, ca. 3–4 cm. long; peduncular branches similarly covered with hairs as those of the males; peduncular bracts ca. 2 cm. long, very broad and foliaceous, very early caducous; floral capitula ca. 3.5 cm. diam., 8–16 in each inflorescence. *Male flowers* sessile; 1–2 mm. long, about half as broad; perianth lightly pubescent; tepals 3 or 4, incurved at apex; stamens 3 or 4, about the same length

as perianth; filaments short, erect; pistillode ca. 1 mm. long, thin at the base, thicker at the apex; interfloral bracts extremely minute. *Female flowers* pedicellate; perianth 2–3 mm. long, half as broad, 4-lobed, apex densely pubescent, soon glabrous; tepals 2 + 2 decussate-imbricate, inner ones broader than outer pair, incurved at the apex; ovary slightly shorter than perianth; stigma ca. 0.5–0.75 mm. long; pedicels 7–8 mm. long; interfloral bracts absent. *Achenes* ca. 3.5 mm. long, ca. 1.5 mm. broad; totally enclosed by persistent perianth, of ca. 5–7 mm. long; pedicels slightly longer than perianth.

ECOLOGY: This species has been recorded from altitude as high as 1,000 metres above sea-level; and seems to grow well along riverine secondary forests (Meijer, 1955 field notes).

VERNACULAR NAMES: Loendang, Poepoe and Pus-pus (Indonesian Malay).

The type specimen of this species has not been examined—it is probably lost. However, from the description, it is not difficult to identify the specimens cited below.

The younger Hooker in 1888 was probably the first botanist to refer to this species. It has already been pointed out in the Historical Review that Hooker described three species groups without names. He noted that the third species group probably belonged to this species *azureum*. I have found that this is not so, and that Hooker's specimens are actually those of *P. suaveolens*.

Then came Bargagli-Petrucchi in 1902, but he could not interpret this species *azureum*. He left it as a "species Poco Note". Lastly, in 1934, Merrill noted that this species is probably the same as Bargagli-Petrucchi's *cordifolium* from Borneo.

This is actually a distinct species. It is apparently close to another Sumatran species, *P. singalense* which was described by Bargagli-Petrucchi in 1902. In *P. singalense*, the lamina have 10–13 pairs of lateral veins each, the pedicels are shorter than the perianth or achenes, and the perianth does not elongate to twice the length of the achenes. In *P. azureum*, however, the lamina have more lateral veins, usually 14–17 pairs, the pedicels are much longer than either the perianth or the achenes, and the perianth elongate to twice the length of the achenes at fruit.

DISTRIBUTION: Sumatra.

Alston 14611, Gunong Gurah, Residency of Atjeh, 22 March 1954 (BM).—*Boden-Kloss SFN. 13085*, Island of Siberut, 12 Sept. 1924 (SING); *SFN. 14549*, Island of Siberut, 21 Sept. 1924 (SING).—*Iboet 421*, Island of Sipora, 16 Oct. 1924 (SING).—*Meijer 3333*, Pajakumbuh, Mt. Sago, Central Sumatra, 14 May 1955 (BO); *7612*, Mt. Sago, 28 April 1957 (L).—*de Voogd 537*. Moearadoea, Palembang, 13 Dec. 1929 (L).

8. **Poikilospermum cordifolium** (Barg.-Petr.) Merr. Contr. Arnold Arbor. 8: 49 (1934).

Conocephalus cordifolius Barg.-Petr. Nuovo G. Bot. Ital. n. ser. 9: 220. t.7 (1902); Merr. J. Straits Br. Asiat. Soc. Special: 229 (1921).

Conocephalus amoenus King ex Hk. f. sensu Ridl. Fl. Mal. Pen. 3: 357 (1924), partim.

TYPE SPECIMEN:—*C. cordifolius* Barg.-Petr.: Beccari 2864, Kuching, Sarawak (Holotype: FI).—Fig. 20.

Twigs 1–2 cm. diam.; periderm soon splitting into large sheets, lightly to densely lenticellate; generally glabrous, very rarely light pubescent; stipular- and petiolar-scars large and prominent, not raised; whitish-grey in dry state. *Lamina* (20–) 30–50 (–65) cm. long, (15–) 20–35 (–40) cm. broad; very broad ovate, or very broad elliptic; coriaceous; generally glabrous, young ones lightly pubescent on veins of abaxial surface; base round to very profound cordate; apex obtuse, rarely acute; lateral veins (8–) 10–12 pairs, very lax and curved, well-spaced, very prominently raised on abaxial surface; intercostals numerous, prominent only at points of departure from lateral veins, the rest often not visible, generally anastomosing. *Petioles* (7–) 10–40 (–50) cm. long, (0.2–) 0.4–0.7 cm. broad; lightly to densely lenticellate; periderm not splitting; generally glabrous, young ones sometimes lightly canescent, soon glabrous. *Stipules* (2.5–) 4–6 (–7) cm. long; usually strongly crescentic; young ones sparsely canescent, soon glabrous; generally fairly persistent, rarely caducous. *Male inflorescences* 4–6 cm. long, 5–6 cm. broad; solitary; branched dichotomously; primary peduncle 2–3.5 cm. long, secondary peduncles 1.5–3 cm. long, tertiary ones very numerous, extremely short and all arranged at ends of secondary peduncles, peduncular branches glabrous, pubescent to dense canescent; peduncular bracts foliaceous and conspicuous, ca. 1 cm. long, glabrous, pubescent to canescent; floral capitula numerous, ca. 0.5 cm. diam. *Female inflorescences* 4–10 (–12) cm. long, 4–10 (–15) cm. broad; solitary; branched once or twice, very rarely more; primary peduncle (1.5–) 3–4 cm. long, secondary one (1.5–) 2–4 cm. long; peduncular branches glabrous, pubescent to canescent; peduncular bracts same as the male or slightly larger, glabrous, pubescent to sparse canescent; floral capitula (1.5–) 3–5 cm. diam; 2 or 4 in each inflorescence, rarely more. *Male flowers* sessile, very rarely subsessile; ca. 2 mm. long, ca. 1 mm. broad; perianth glabrous to light canescent; tepals 4, incurved at the apex; stamens generally 4, rarely less; filaments straight, very thin; pistillode very thin and transparent; interfloral bracts usually absent. *Female flowers* pedicellate; perianth 2–3 mm. long, 1–1.5 mm. broad, generally glabrous, very rarely pubescent, 4-lobed; tepals strongly incurved at the apex; ovary ca. 1.5 mm. long,

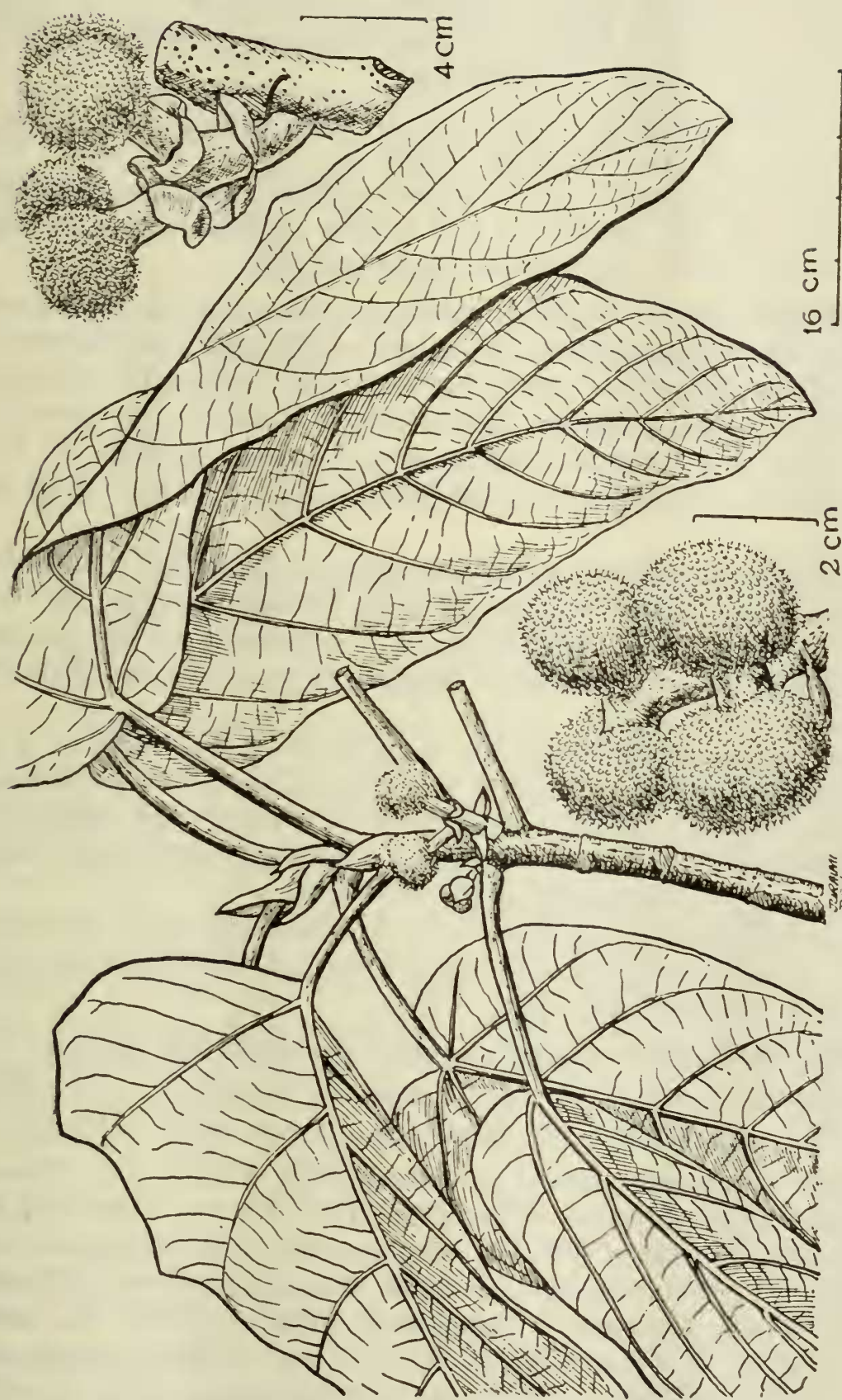


Fig. 20. *Poikilospermum cordifolium*. Twig and female inflorescences.

half as broad; stigma ca. 1 mm. long, rarely shorter; pedicel ca. 4–6 mm. long. *Achenes* 3–5 mm. long, 1–1.5 mm. broad; enclosed by persistent perianth; pedicel very long compared to achene.

ECOLOGY: Many collectors have found plants of this species frequenting streams at low altitudes. I have found them along streams as well as in Malay villages. They seem to prefer slightly shaded areas to dark forest interiors.

ECONOMIC USES: Corner (1932) recorded the use of the dried stems by the Malays in Johore for keeping fire alive. He noticed that the dried stems would smoulder for hours; and that whenever fire was needed, it was readily rekindled, thus saving the matches which the natives could ill afford.

VERNACULAR NAMES: Akar satuwan and Semelit papan (Malay Peninsula). Bunatol, Gunatol and Saringkarang (Borneo).

Plants of this species have been known to attain the greatest dimension in the subgenus *Ligulistigma*. The petioles of some of the plants may be much thicker than the twigs of those of, for example, *P. microstachys*. Their huge stems are fairly lianoid in habit.

Although this species is quite common in the Malay Peninsula, it has escaped from Malayan botanical literature because of mistaken identity. Ridley equated a lot of collections of this species with Hooker's *amoenus*, which happens to be a Malayan form of *P. suaveolens*.

There is no doubt about the distinctness of this species. It is true that the inflorescences of *P. cordifolium* and *P. suaveolens* are very similar; but they differ from each other very clearly on venation of lamina, on the periderm appearance of the twigs and petioles and on the overall size of the plant.

This species is absent from Java. The two collections from the Bogor Botanic Gardens were made from plants whose origin was Sumatra (Forman, field notes, 1956).

DISTRIBUTION: Sumatra, Malay Peninsula and Borneo.

Sumatra: *Batten-Pool s.n.*, unknown locality, 3 June 1939 (SING).—*Nur SFN. 7237*, Sibolangit, 12 Aug. 1921 (SING).

Malay Peninsula: *Burkill & Haniff SFN. 13625*, Grik, Perak, 19 June 1924 (SING).—*Chew Wee-Lek CWL. 1*, Singapore, 31 Dec. 1956 (SING); *CWL. 77*, Jerangau For. Res., Trengganu, 30 March 1957 (CGE & SING).—*Chew Wee-Lek & Kiah CWL. 90*, Bukit Bakar, Kelantan, 2 April 1957 (SING); *CWL. 94*, same loc. & date. (CGE & SING).—*Corner s.n.*, S. Sedili Johore, 26 March 1932 (SING).—*Deshmukh s.n.*, Singapore, 20 July 1921 (SING).—*Henderson SFN. 19623*, Gua Ninik, Kelantan, 24 Oct. 1927 (SING).—*Nur SFN. 8962*, Batu Caves, Selangor, 2 Oct. 1922 (SING); *s.n.*, Singapore, 10 Sept. 1918 (SING).—*Ridley 4820 Langat*, Selangor, 17 Nov. 1892 (BM & SING).—*Seimund 573*, Kuala Teku, Pahang (SING).—*Yapp 594*, Perak, 3 Jan. 1900 (CGE).

Borneo: *Beccari* 2864, Kuching, Sarawak (FI).—*Boden-Kloss SFN*. 18715, Samawang, Sandakan, 14 July 1927 (SING).—*Chew Wee-Lek CWL*. 330, Niah Caves, Niah District, Sarawak, 7 June 1962 (A. E. L, SAR & SING).—*Creigh s.n.*, Sandakan North Borneo, April 1895 (BM).—*Elmer* 20671 Tawao, Br. North Borneo (BM, BR, C, G, M, P & SING).—*Kadir* A3603, Elopura, Sandakan, N. Borneo, 31 Aug. 1951 (BO, L & SING).

Java (cultivated): *Corner XV. B. 105*, Hort. Bogor, 1959 (CGE).—*Forman* 42, Hort Bogor, 21 Feb. 1956 (L).

9. ***Poikilospermum erectum*** (Blco.) Merr. Contr. Arnold Arbor. 8: 49 (1934).

Procris erecta Blco. Fl. Filip. 707 (1837).

Conocephalus erectus (Blco.) F.-Villar, Novis. App. 203 (1880); Barg.-Petr. Nuovo G. Bot. Ital. n. ser. 9: 230 (1902); Merr. Bur. Govt. Lab. 27: 80 (1905) et Species Blancoanae 129 (1918), exclud. syn. *C. grandifolius* Warb. et Enum. Philip. Fl. Pl. 2: 70 (1923).

Conocephalus canescens Warb., in Perkins, Frag. Fl. Philip. 167 (1904).

TYPE SPECIMENS:—*P. erecta* Blco.: Type specimen destroyed! *Merrill Sp. Blco.* 960. Cavite Prov., Luzon, Philippine Islands, May 1915 (Neo-type: BM; duplicates; B & K).—*C. canescens* Warb.: *Warburg* 12479, Marivelis, Bataan, Luzon, Philippine Islands (Holotype: B).

Twigs 1–2 cm. diam; periderm lightly to densely lenticellate, frequently peeling into sheets; glabrous to very dense pubescent, especially young parts; stipular- and petiolar-scars often very prominent; light grey to light brown in dry state. *Lamina* (15–) 20–40 cm. long, (10–) 12–30 cm. broad; very broad ovate; very coriaceous; generally thickly canescent on abaxial surface, very rarely glabrous or pubescent; base round, cordate to profound cordate; apex obtuse to slightly acute; lateral veins 8–10 (–12) pairs, very prominent beneath; lax, curved and well-spaced; intercostals prominent to almost faint, well-spaced, frequently anastomosing. *Petioles* (6–) 8–25 cm. long, 0.5–0.7 cm. diam.; smooth to densely lenticellate; generally light canescent or pubescent, very rarely glabrous. *Stipules* 4–6 cm. long; straight to strongly crescentic; glabrous to thickly pubescent, very rarely canescent; generally persistent, rarely caducous. *Male inflorescences* 8–12 cm. long, 8–16 cm. broad; solitary; branched dichotomously 5–7 times; secondary peduncles generally longer than primary one, rarely shorter; peduncles generally light to dense canescent, peduncular bracts conspicuous, ca. 1 cm. long, light to dense canescent, floral capitula 0.3–0.5 cm. diam.; very numerous. *Female inflorescences* 9–12 cm. long, 12–20 cm. broad; solitary; branched dichotomously about 4 times; primary peduncle ca. 3 cm. long, secondary one usually longer, generally light canescent, soon sparse canescent;

peduncular bracts same as male; floral capitula ca. 1.5 cm. diam.; ca. 16 in each inflorescence. *Male flowers* sessile; ca. 1.25 mm. long, ca. 1 mm. broad; perianth thickly canescent, especially the apex; tepals 4, incurved at the apex; stamens 4, rarely less, ca. 1 mm. long, with straight filaments; pistillode ca. 0.75 mm. long, thin, transparent; interfloral bracts almost absent. *Female flowers* pedicellate; perianth 3–3.5 mm. long, ca. 1.25 mm. broad; 4-lobed; lobes light canescent to light pubescent, very rarely glabrous, very often with cystoliths; tepals incurved at the apex; ovary ca. 2 mm. long, ca. 1 mm. broad; stigma ca. 1 mm. long; pedicel short, 1–2.5 mm. *Achenes* ca. 3 mm. long, ca. 1.5 mm. broad; apex slightly appearing above the persistent perianth; pedicel often very short compared to achene.

ECOLOGY: Herbarium labels provide practically no ecological information of this species whatsoever apart from the fact that these plants are fairly common along rivers in the Philippine Islands. Merrill (1923) recorded that these plants occur “. . . in forests at low and medium altitudes.”

ECONOMIC USES: Sulit recorded that cut stems might yield potable water. Apart from this, this species seems fairly useless economically.

VERNACULAR NAME: Hanopol (Tagalog.).

Blanco was the first botanist to have recorded this species from the Philippine Islands; and being unmindful of Blume's publication of *Conocephalus*, he named it *Procris erecta* in 1837. The holotype was probably destroyed by fire in Manila; and repeated attempts to trace it in Spain or elsewhere have been futile.

F. Villar in 1880 transferred this species to its proper place; and he combined it to *Conocephalus erectus*. Then in 1918, Merrill published his “Species Blancoanae”, and in it he tried to identify Blanco's species by means of illustrative specimens collected from all the localities which Blanco was supposed to have visited. As far as this species is concerned, Merrill represented it by means of his “Sp. Blco. 960”.

I have compared this specimen very critically with Blanco's description and could find no cause whatsoever to disagree with Merrill. Hence, this collection is here taken as a Neo-type.

Regarding Warburg's *canescens*, which is again based on a Philippine collection, I have found that the type specimen is a younger (and smaller) plant of this species. Merrill had already reduced it to this species in 1923, to whose decision I fully subscribe.

DISTRIBUTION: Philippine Islands.

Philippine Islands: *Edano PNH*. 37105, Sorsogon, Luzon, 11 June 1956 (L & PNH).—*Elmer* 7284, Leyte, Jan. 1906 (G); 10651, Davao, Mindanao, May 1909 (BM, FI & G); 13901, Agusan, Mindanao, Sept. 1912 (C, FI, G, K & P); 15250, Sorsogon, Luzon, Dec. 1915 (BM & L).—*Loher* 6904, sine loc. (M).—*Merrill Sp.*

Blco. 871, Rizal, Luzon, March 1915 (K & P); 960, Cavite, Luzon, May 1915 (B, BM, K & P).—*Ramos* 42703, Bohol, Oct. 1923 (G & SING).—*Ramos & Pascasio* 34905, Siargao Island, June 1919 (SING).—*Sulit PNH.* 6052, Loquilocon, Wright, Samar, 14 April 1948 (PNH); *PNH.* 7042, Laguna, Luzon, 18 April 1947 (PNH).—*Warburg* 12479, Marivelis, Luzon (B).—*Wenzel* 3449, Surigao, 1 June 1928 (C, K & M).

10. ***Poikilospermum lanceolatum*** (Trec.) Merr. Contr. Arnold Arbor. **8**: 50 (1934), exclud. syn. *C. subtrinervius* Miq.

Conocephalus lanceolatus Trec. Ann. Sci. Nat. ser. 3. **8**: 88 (1847); Barg.-Petr. Nuovo G. Bot. Ital. n. ser. **9**: 226 (1902).

TYPE SPECIMEN:—*C. lanceolatus* Trec.: Griffith s. n., India, 1843 (Holotype: P).

Twigs 0.5–1.5 cm. diam., periderm splitting longitudinally to narrow, long sheets; young parts very light pubescent, soon glabrous; scarcely lenticellate; stipular- and petiolar-scars quite prominent; brown to light brown in dry state. *Lamina* (13–) 15–30 cm. long, (6–) 8–15 cm. broad; lanceolate, elliptic to very broad elliptic; slightly coriaceous; very sparsely to densely pubescent on abaxial surface; base cuneate to very round; apex acute to long acuminate; acumen 0.75–2 cm. long; lateral veins 11–12 pairs, very rarely more, quite prominent; intercostals very numerous, quite prominent. *Petioles* (2.5–) 5–11 cm. long, ca. 0.4 cm. broad, smooth; young ones light pubescent, soon glabrous. *Stipules* 1.5–3 cm. long, quite straight; lightly pubescent; early caducous. *Male inflorescences* 2.5–5 cm. long, 2–9 cm. broad; branched dichotomously 3–6 times; secondary peduncles generally longer than primary one, rarely shorter; peduncles generally light pubescent; peduncular bracts small, inconspicuous, ca. 0.2 cm. long, usually paired, sometimes single; floral capitula 0.3–0.5 cm. diam., 8–40 (–60) in number. *Female inflorescences* 3–4 cm. long, 4–5 cm. broad; branched dichotomously ca. 3 times; primary and secondary peduncles about the same length; all branches generally light pubescent; peduncular bracts same as the male; floral capitula 1–1.5 cm. diam., (4–) 6–8 in number. *Male flowers* sessile; perianth ca. 2 mm. long, 2.5 mm. broad, short obpyramidal; completely glabrous, well-covered with elongate cystoliths; tepals 4, rarely less; stamens 4, with straight short filaments; rudimentary ovary large, obpyramidal. *Female flowers* short pedicellate; perianth 2.5 mm long, half as broad, inverted pear-shaped; glabrous, apex with cystoliths; 4-lobed; tepals curved at apex; ovary about the length of perianth; stigma short; pedicel about the same length as perianth. *Achenes* 3.5–4.5 mm. long, 2–2.5 mm. broad; apex slightly appearing above the persistent perianth; pedicel extremely short compared to achene.

ECOLOGY: This species seems to be common in Monsoon Forests, and has been found at altitudes of above 2,000 metres.

VERNACULAR NAME: Monkakrik (N.-E. India).

Merrill (1934) considered Miquel's *C. subtrinervius* (= *P. subtrinervium*) conspecific with this species and he therefore reduced the former to a synonym. Miquel's type specimen was collected from Sumatra, while this species is entirely confined to Continental Asia. I have not yet come across any specimen from Malaysia that approaches this species in circumscription. This led me to study Miquel's description more critically. Having compared Miquel's description with Trecul's description, type specimen and even later collections of *P. lanceolatum*, I realised that *P. lanceolatum* and *P. subtrinervium* are two totally different species.

DISTRIBUTION: N.-E. India, Burma and China.

N.-E. India: *Barnard s.n.*, Digboi, Upper Assam, May 1935 (BM).—*Chatterjee s.n.*, Ghagra, Assam, April 1902 (P).—*Clarke 13918*, Sikkim, 3 March 1871 (BM); *27621*, Nampok, Sikkim, April 1876 (K); *27914*, Sikkim, 13 March 1876 (BM); *38008A*, Sonari, Seebasangur, 22 April 1885 (K); *43042*, India (K).—*Gamble 402A*, Taipu River, March 1876 (K); *2430A*, Chenga River, Sikkim, 15 Jan. 1877 (K); *7620*, Bhutan (K); *7673*, W. Duars, Jan. 1880 (K).—*Griffith 4674*, East Bengal (K & M).—*Haines 612*, West Duars, Feb. 1896 (K).—*Hooker s.n.*, Sikkim, India (BM, C, CGE, G, M & P).—*King s.n.*, Bhutan, 1875–1876 (K).—*Lacaita 16573*, Sikkim, 26 April 1913 (P); *16574*, Sikkim, 26 April 1913 (BM).—*Masters s.n.*, Assam (M).—*Meebold 10879*, Laimatak, Manipur, Feb. 1906 (SING).

Burma: *Haines 5838*, Katha, Upper Burma, 3 March 1915 (K).—*Rogers 821*, Myikyina, 7 May 1910 (E); *s.n.*, Kahta, March 1915 (K).

China: *Henry 11795 & 11795A*, Szemen, Yunnan (K).—*Rock 2388*, Muang Han & Muang Hai, S. Yunnan, Feb. 1922 (E).

11. **Poikilospermum microstachys** (Barg.-Petr.) Merr. Contr. Arnold Arbor. **8**: 50 (1934).

Conocephalus subtrinervius Miq. sensu Hooker f. Fl. Br. Ind. **5**: 546 (1888); Barg.-Petr. Nuovo G. Bot. Ital. n. ser. **9**: 226 (1902); Merr. J. Straits Br. Asiat. Soc. **Special**: 230 (1921); Ridl. Fl. Mal. Pen. **3**: 358 (1924).

Conocephalus microstachys Barg.-Petr. l. c. 223. t. 9.; Merr. J. Straits Br. Asiat. Soc. **Special**: 229 (1921).

Conocephalus amethystinus Winkl. Bot. Jahrb. **49**: 359 (1913); Merr. J. Straits Br. Asiat. Soc. **Special**: 228 (1921).

Poikilospermum amethystinum (Winkl.) Merr. Contr. Arnold Arbor. **8**: 48 (1934).

TYPE SPECIMENS:—*C. microstachys* Barg.-Petr.: *Beccari 123*, Kuching, Sarawak, Borneo (Holotype: FI).—*C. amethystinus* Winkl.: *Winkler 2828*, Batu Babi, S-O Borneo, 10 July 1908 (Holotype: B; isotypes: BM, P & SING).—

Fig. 21.



Fig. 21. *Poikilospermum microstachys*. Twig with female inflorescences.

Twigs 0.3–0.5 (–0.75) cm. diam.; frail, straight and glabrous; densely lenticellate; white-grey, grey to light brown coloured in dry state; periderm not splitting into flakes or sheets; stipular- and petiolar-scars not very prominent; prostrate parts usually with adventitious roots. *Lamina* (10–) 12–27 cm. long, 3–7 cm. broad; oblanceolate, very rarely elliptic; bases cuneate to round; apex acuminate, rarely acute; lateral veins (6–) 7–9 pairs, strongly arched, basal pair straight and prominent; intercostals quite prominent; chartaceous; entirely glabrous; brown to light brown when dried. *Petioles* (3–) 4–13 cm. long, 0.2–0.3 cm. broad; frail, straight and smooth, cystoliths often visible; entirely glabrous. *Stipules* 1–2 cm. long; slightly crescentic; chartaceous; edges always wavy; glabrous; persistent. *Male inflorescences* 0.5–2 cm. long, 0.5–1.5 cm. broad; solitary, paired to numerous; usually once branched; primary peduncle filiform, very short; secondary peduncles filiform, slightly longer; peduncular bracts paired, persistent, prominent; floral capitula 2, each 0.25–0.5 cm. diam. *Female inflorescences* 1–2 cm. long, 1.5–3 cm. broad; usually solitary, very rarely paired; once branched; primary and secondary peduncles filiform, about the same length; peduncular bracts same as for the males; floral capitula 2, each 0.5–2 cm. diam. *Male flowers* sessile to subsessile; perianth 1–1.5 mm. long, ca. 0.5 mm. broad; sparsely pubescent; tepals 4, apex sharp acute, deeply incurved; stamens 4, slightly shorter than tepals; filaments short and erect; pistillode ca. 1 mm. long, thin, transparent; interfloral bracts minute. *Female flowers* pedicellate; perianth 2–3.5 mm. long, 1–2 mm. broad; 4-lobed; tepals 2 + 2 decussate-imbricate, strongly incurved; ovary ca. 1.5 mm. long, 0.5 mm. broad; stigma 0.5–0.75 mm. long; pedicels 1.5–2 mm. long; interfloral bracts minute. *Achenes* 2.5–3.5 mm. long, 1–1.25 mm. broad; enclosed by persistent perianth; much longer than pedicels.

ECOLOGY: This species seems to prefer damp forests such as swamps. It is also common along rivers. It seems to be very scarce in either very dry and exposed habitates or dark forest interiors.

ECONOMIC USES: Burkill noted that the Malay name “Landong” probably refers to the use made of the stems as crude ropes.

VERNACULAR NAMES: Akar sasar and Landong Padi (Malaya). Aloepoen and Langkoekoe (Borneo).

Although the authorship of this species is credited to Bargagli-Petrucci, he was by no means the first to describe it. Hooker had earlier in 1888 described it, but he erroneously equated it with Miquel's *subtrinervium*. This error was perpetuated by many later botanists.

The other epithet, *amethystinus*, was created by Winkler in 1913, and was also based on a Bornean collection. Winkler's type specimen is found to be conspecific with *microstachys*. The differences he drew between *amethystinus* and *microstachys* are merely individual differences, namely size and shape of lamina.

This is a very distinct species; and can easily be recognised either in the field or in the herbarium. The inflorescences of the male plants are very greatly reduced in size as well as in the number of floral capitula. Besides, most of the male plants tend to have more than one inflorescence at each leaf axil.

DISTRIBUTION: Sumatra, Malay Peninsula and Borneo.

Sumatra: *Rahmat-si-Boeea* 849, Taloen Djoring, July-Aug. 1928 (SING); 6766, Hoeta Bagasan, Asahan, 7 Sept. 1934 (SING).

Malay Peninsula: *Alvins* 308, Malacca, 15 Dec. 1885 (SING); 3327, Negri Sembilan, 31 Oct. 1885 (SING).—*Burkill SFN* 4106, Kuala Langat, Selangor, 4 May 1919 (SING); *SFN*. 6395, Gemas, Negri Sembilan, 16 Sept. 1920 (SING); *SFN*. 7013, Klang, Selangor, 13 March 1921 (SING); *SFN*. 7028, Klang, Selangor, 13 March 1921 (SING).—*Burkill & Haniff SFN*. 17064, 8 miles S. of K. Lipis, Pahang, 17 Nov. 1924 (SING).—*Burn-Murdoch SFN*. 172, Temerloh, Pahang, 12 June 1913 (SING).—*Chew Wee-Lek CWL*. 33, Ulu Sedili, Johore, 26 Feb. 1957 (SING); *CWL*. 73, Jerangau For. Res., Trengganu, 30 March 1957 (CGE, L & SING); *CWL*. 127, Sungei Charok Durian, Baling, Kedah, 10 April 1957 (SING).—*Chew Wee-Lek & Kiah CWL*. 86, Jalan Kelantan, Trengganu, 31 March 1957 (CGE, L & SING); *CWL*. 92, Sungei Merkill, Bukit Bakar, Kelantan, 2 April 1957 (SING); *CWL*. 95, Sungei Merkill, Bukit Bakar, Kelantan, 2 April 1957 (CGE & SING); *CWL*. 102, Kemahang For. Res., Kelantan, 3 April 1957 (CGE, L & SING); *CWL*. 110, Sungei Merkill, Bukit Bakar, Kelantan, 4 April 1957 (CGE, L & SING).

Corner SFN. 30135, Ulu Bendong, Kemaman, 1 Nov. 1935 (SING); *SFN*. 30723, Mawai-Jemaluang Road, Johore, 12 Jan. 1936 (SING).—*Curtis* 1009, Penara Bukit, Penang, Oct. 1886 (SING).—*Flippance s.n.*, Botanic Gardens, Singapore, 9 May 1921 (SING).—*Haniff SFN*. 14190, Telok Anson, Perak, 24 Sept. 1924 (SING).—*Henderson SFN*. 19546, Gua Ninik, Kelantan, 27 Oct. 1927 (SING); *SFN*. 24814, Sungei Ketil, Kelantan, 30 May 1931 (SING).—*Hullet s.n.*, Penang Hill, Penang, April 1884 (SING).—*Hume* 8298, 8314a, Semenyih, Selangor, 27 July 1921 (SING).—*Kiah SFN*. 31967, Sungei Kayu, Johore, 7 Oct. 1936 (L & SING); *SFN*. 35129, Koh Mai For. Res. Kedah, 2 April 1938 (SING).—*King's Coll.* 510, Gopeng, Perak (FI); 3423, Larut, Perak, Oct. 1882 (BM); 10003, Perak (P).—*King s.n.*, Malaya, 1879 (FI).—*Lobb* 282, Singapore, 1846 (BM, CGE, FI & G).—*Maingay KD* 1487, Malaya (BM).—*Nur s.n.*, Botanic Gardens, Singapore, 9 Sept. 1919 (SING).—*Ridley* 2311, Kuala Tembeling, Pahang, 1891 (SING); 7630, Bukit Hitam, Selangor, May 1896 (SING); 14642, Ulu Temangu, Perak, July 1909 (SING); *s.n.*, Gunong Tungal, Dindings, Jan. 1897 (SING).—*Scortechini s.n.*, Perak (CGE, G & P).—*Sinclair SFN*. 39271, Tiger Hill, Penang, 10 Oct. 1951 (L & SING).—*Sinclair & Kiah SFN*. 39868, Bukit Besi, Trengganu, 10 July 1953 (L & SING).

Symington 24082, Kajang, Selangor, 28 March 1930 (SING).—*Wray Jr.* 1338, Tapa, Perak (SING); 1393, Tapa, Perak (SING); 2574, Assam Kumbang, Perak, July 1888 (SING); 3295, *Relau Tujur*, Perak, Oct. 1888 (SING).

Borneo: *Anderson* 8552, Betong, Sarawak, 13 Aug. 1957 (L).—*Beccari* 39, Kuching, Sarawak, June 1865 (FI); 123, Kuching, Sarawak (FI); 244, 853, 854, 2696, 2709 and 2939, Sarawak (FI).—*Brooke* 8637 and 9407, Kuching, Sarawak, 1954 (L); 8700, 8794 and 8844, Sarawak 1954 (G & L).—*Elmer* 20668, Tawao, Br. N. Borneo, Oct. 1922/March 1923 (C, G, P & SING); 21269, same loc. & date, (BM, C, G, L, P & SING).—*Enoh* 309, Pontianak, Poenggoer, 25 Sept. 1948 (L & SING).—*Hullet s.n.*, Matang, Sarawak, 1890 (SING).—*Illias* 8083, Sarawak, 14 May 1957 (L).—*Keith* 9097, Hulu Biyudun River, N. Borneo, 11 June 1938 (SING).—*Kloss SFN.* 19032, Bettotan, Sandakan, 31 July 1927 (SING).

Loibatt s.n., Kuching, Sarawak, 4 Jan. 1895 (SING).—*Mondi* 25, 12 March 1931 (U).—*Polak* 643, W. Borneo, 9 Oct. 1940 (L).—*Purseglove P.* 4389, Kuching, Sarawak, 14 Sept. 1955 (L & SING).—*Purseglove & Shah P.* 4383, Kuching, Sarawak, 14 Sept. 1955 (L & SING).—*Ridley s.n.*, Bau, July 1903 (SING); *s.n.*, Kuching, Aug. 1904 (SING).—*Saheb s.n.*, Sarawak, 1911 (SING).—*Samsuri b. Tahir* 9272, Sarawak, 7 Nov. 1957 (L).—*Slooten* 2202, Tanahboemboe, Batoebitjin, 30 Oct. 1928 (SING); 2245, Tanahboemboe, 1 Nov. 1928 (B.).—*Smythies et al.* S. 5859, Brunei, 14 April 1957 (L).—*Teysmann* 11258, Pontianak (FI).—*Winkler* 2828, Batu Babi, S.-O. Borneo, 10 July 1908 (B, BM, P & SING).—*Wyatt-Smith* 80289, Jesselton, N. Borneo, 3 Aug. 1954 (L).

Java: Warburg 1305, May 1886 (B)—cultivated!

12. *Poikilospermum naucleiflorum* (Roxb. apud Lindl.) Chew. comb. nov.

Conocephalus naucleiflorus Roxb. apud Lindl. Bot. Reg. **14**: 1203, A & B. (1828), (Basionym!); Trec. Ann. Sci. Nat. ser. 3. **8**: 92 (1847); Koords. Exkursionfl. Java, **2**: 122. t. 27 (1912), quoad spec. typ. tantum.

Urtica naucleiflora Roxb. Fl. Ind. **3**: 592 (1832); Ic. Roxb. t. 2379.

Conocephalus roxburghii Trec. l. c. 89.

Conocephalus suaveolens Bl. sensu Benn. in Horsfield, Pl. Jav. rar. 47 (1838), exclud. spec. typ. et tab.; Hk. f. Fl. Br. Ind. **5**: 545 (1888), partim; Barg.-Petr. Nuovo G. Bot. Ital. n. ser. **9**: 218 (1902), partim; Cooke, Fl. Bomb. 659 (1907), partim; Merr. J. Straits Br. Asiat. Soc. **Special**: 229 (1921), partim et Enum. Philipp. Fl. Pl. **2**: 71 (1923), partim.

Conocephalus naucleiformis Lindl. ex Jackson, Ind. Kew. **1**: 597 (1893), typo. err.

Poikilospermum suaveolens (Bl.) Merr. Contr. Arnold Arbor. **8**: 47 (1934), partim.

TYPE SPECIMENS: *C. naucleiflorus* Roxb. apud Lindl : Type not available; *Icones Roxburghianæ* t. 2379 (K).—*C. roxburghii* Trec.: Wall. Cat. 4624A, Silhet, N.E. India (Holotype: P; isotypes: CGE, G, K, LE & M).

Twigs ca. 1 cm. diam.; periderm splitting into numerous flakes; lenticels sparse, rarely crowded; young parts pubescent, soon glabrous; stipular-scars not prominent, petiolar-scars very prominent; dirty-brownish in dried state. *Lamina* 10–25 cm. long, 6–18 cm. broad; narrow to broad ovate, very rarely elliptic; more or less coriaceous; very rarely pubescent on the abaxial surface, generally glabrous; base round, subcordate to cordate; apex obtuse to sharp acute, very rarely acuminate; lateral veins 10–13 pairs; intercostals not many, well-spaced. *Petioles* (4–) 6–12 cm. long, ca. 0.2–0.3 cm. broad; periderm splitting into flakes of same appearance as those of twigs; young ones light pubescent, soon glabrous. *Stipules* 1–2 cm. long, usually arched; young ones slightly pubescent; early caducous, very rarely persistent. *Male inflorescences* 3–7 cm. long, 3–8.5 cm. broad; solitary; dichotomously branched 3–5 times; primary, secondary and tertiary peduncles about the same length; young peduncles generally dense to very dense pubescent, soon quite glabrous, peduncular bracts paired, ca. 1 cm. long, persistent, usually foliaceous, lightly pubescent, soon glabrous; floral capitula very numerous, each 0.3–0.5 cm. diam. *Female inflorescences* 4–9 cm. long and broad; solitary; branched dichotomously 3–4 times; primary peduncle about twice as long as the secondary ones, tertiary peduncles usually slightly shorter; all parts light pubescent when young, soon glabrous; peduncular bracts about the same as for the males; floral capitula ca. 1–2 cm. diam., rarely larger; 4–8 capitula in each inflorescence. *Male flowers* sessile; 1–2 mm. long, ca. 1 mm. broad; perianth 4-partite, lightly to very densely covered with short to long, sharp transparent hairs; apex of tepals slightly curved; stamens 3–4, with short erect filaments; pistillode columnar, slightly shorter than stamens. *Female flowers* pedicellate; perianth 2–3 mm. long, ca. 1 mm. broad; 4-lobed; usually pubescent, sometimes glabrous; tepals slightly incurved, with cystoliths; ovary slightly shorter and narrower than perianth; stigma usually short, about one-quarter the length of the ovary; pedicels about the same length as perianth. *Achenes* ca. 2 mm. long, ca. 1 mm. broad; completely covered by persistent perianth; pedicel very long compared to achene.

ECOLOGY: This species seems to prefer the monsoonal forests of north-eastern India and has not been found in the Rain Forests of Malaysia.

VERNACULAR NAMES: Dolea Lat and Lat Cadam (Indian).

It was Roxburgh who first named this species *Urtica naucleiflora* in 1814; but to which he gave no description. It was much later that he described it in manuscript only. In 1828, Lindley then published Roxburgh's manuscript; but instead of retaining *naucleiflora* as a species of *Urtica*, he rightly combined it to *Conocephalus naucleiflorus*.

Typification of this species presents some difficulties. In the first place, Roxburgh did not typify it in his description. There are a few collections from India that bear Roxburgh's handwriting; but whether these had been seen by him before or after his description one can hardly say.

In the Kew Herbarium, there is a large plate of this species by Roxburgh and this plate corresponds very closely with the specimens that bear his handwriting. I therefore see no reason why one should not typify this species by Roxburgh's plate.

In 1847, Trecul created his *C. roxburghii* which he based on a collection of Wallich, namely *Wall. Cat. 4624A* from Silhet in N.-E. India. This collection corresponds also very closely to Roxburgh's plate: Trecul's *roxburghii* is therefore regarded as conspecific with *naucleiflorum*.

Bennett in the year 1838, considered this species to be conspecific with Blume's *suaveolens*, which decision met the approval of numerous botanists. I have compared the two species very carefully and come to the conclusion that they are different from each other. In the first place, their stigmas bear different ratios to their respective ovaries. In *suaveolens*, the stigmas are as long if not longer than the ovaries; whereas in *naucleiflorum*, the stigmas are very short compared to the ovaries. Besides, the inflorescences are greatly ramified; while in *suaveolens*, such a phenomenon is not observable.

DISTRIBUTION: India, Burma and Thailand.

India: *Clarke 8407*, Sylhet Station, 30 March 1869 (K).—*Gaudichaud 445*. Calcutta (G & P).—*Hooker & Thomson s.n.*, Mount Khasia (C, CGE & P).—*King's Coll. 350*. Chittagong Hill Tracts, 1887 (CGE); *491*, Chittagong Hill Tracts, 1886 (E, G & P).—*Lemann s.n.*, Bengal (CGE).—*Lister s.n.*, Chittagong Hill Tracts, 1876 (K).—*Pierre 4803*. Hort. Bot. Calcutta, 4, 1863 (P).—*Roxburgh ? s.n.*, India, 1815 (P).—*Wall. Cat. 4624A*, Silhet (CGE, G, K, LE, M & P).—*Wall. Cat. 4624B*, Hort. Bot. Calcutta (CGE & P).—*Wall. Cat. 4624C*, 1825 (M).—*Wall. Cat. 4634*, Nepal, 1832 (P).

Burma: *Gallatly* 807, Tenasserrim, 16 April 1877 (K); 933, Chu-ku Plains, Tenasserrim, 27 April 1877 (K).—*Griffith* 1111, Mergui (K).—*Kurz* 3124, Pegu (K).—*Mg. Tha. Myang* 145, Amherst, 27 April 1910 (K).—*Parkinson* 1973, Kananggyi, S. Tenasserrim, 4 March 1926 (K).

Thailand: *Bloembergen & Kostermans* 502, Kwae Noi Basin, 4 May 1946 (BO, K, L & SING).

13. *Poikilospermum oblongifolium* (Barg.-Petr.) Merr. Contr. Arnold Arbor. 8: 51 (1934).

Conocephalus oblongifolius Barg.-Petr. Nuovo G. Bot. Ital n. ser. 9: 222. t. 8 (1922); Merr. J. Straits Br. Asiat. Soc Special: 229 (1921).

TYPE SPECIMEN: *C. oblongifolius* Barg.-Petr.: *Beccari* 3360, Sungei Unpanang, Pontianak, West Borneo (Holotype: FI).

Twigs 0.5–1 cm. diam.; periderm longitudinally ridged, not splitting into flakes or sheets; lenticels few, large, mainly at the nodes; entirely glabrous; petiolar-scars very prominent, stipular-scars not so; light dirty-grey in dry state. *Lamina* 17–26 cm. long, 5–9 cm. broad; oblong to oblanceolate, rarely elliptic, generally broadest at or above the middle; very coriaceous; veins on the abaxial surface extremely sparse canescent; otherwise glabrous; base truncate, round to very cuneate; apex acuminate, acumen extremely short to as long as 2.5 cm., very rarely acute; lateral veins 8–10 (–12) pairs, usually very rigid, straight and closely set, basal pair more prominent; intercostals very numerous, straight and closely set. *Petioles* 2–6 (–11) cm. long, ca. 0.3 cm. broad; periderm very smooth, not splitting, non-lenticellate; entirely glabrous. *Stipules* 2–4 cm. long; very rigid, often strongly crescentic; young ones very sparsely pubescent, soon glabrous; often persistent, sometimes early caducous. *Male inflorescences* 1.5–5 cm. long, 4–7 cm. broad; solitary; dichotomously branched many times; primary peduncles ca. 1–2 cm. long, secondary peduncles slightly shorter; tertiary peduncles usually extremely short, hence the pseudo-umbellate arrangement of floral capitula; peduncular branches light to dense pubescent, soon glabrous; peduncular bracts 0.5–1 cm. long, broad foliaceous, light pubescent, soon glabrous; floral capitula ca. 0.3–0.5 cm. diam., numerous. *Female inflorescences* ca. 5 cm. long and broad; solitary; branched dichotomously twice; primary and secondary peduncles ca. 2–3 cm. long, tertiary ones extremely short; peduncular branches light pubescent, soon glabrous; peduncular bracts ca. 1 cm. long, very broad and foliaceous; floral capitula ca. 1 cm. diam.; usually 4 in each inflorescence. *Male flowers* sessile; 1–2 mm. long, 0.5–1 mm. broad; perianth dense pubescent, soon glabrous; tepals 4, incurved at the apex; stamens 3–4, much shorter than perianth; filaments short, straight; pistillode about the same length as perianth, either straight and thin or with a

globular head; interfloral bracts minute and often absent totally. *Female flowers* pedicellate; perianth ca. 2 mm. long, ca. 1 mm. broad; densely pubescent, soon glabrous, 4-lobed; tepals 2 + 2 decussate-imbricate, inner ones broader, incurved at the apex; ovary slightly shorter than perianth; stigma 0.5 mm. long; pedicels ca. 2 mm. long; interfloral bracts extremely minute, often absent. *Achenes* ca. 3 mm. long, ca. 1 mm. broad; apex slightly exserted above persistent perianth; pedicels not elongating, much shorter than achenes.

ECOLOGY: Most of the collections had come from lowland riverine forests, but one was collected from as high as 1,800 metres in the Philippine Islands. Kostermans noted that his collection came from loam soil with limestone.

VERNACULAR NAME: Hanopol (Philippine Islands).

Vegetatively, this species can easily be mistaken for *P. microstachys*. This is especially so with those plants having long acuminate lamina. The reproductive structures of these two species are, however, vastly different as one can see from the key.

This species was based by Bargagli-Petrucci on a collection of Beccari from the Dutch part of West Borneo. Merrill in 1921 had equated three collections of Clemens from Borneo with it. I cannot confirm Merrill's identification of these collections since I have not been able to trace these specimens.

It has now been found that this species also occurs in the Philippine Islands; and the three collections cited below came from the southern part of these islands.

It is interesting to note that the Philippine materials appear to be slightly different from the Bornean one. The pistillodes of the male flowers of the former materials tend to have rather enlarged globular heads, whereas those of the latter materials do not have such pistillodes. This may be a good character on which two geographical subspecies could be recognised; but since only three collections of the Philippine materials have been examined, it might be well to await for more collections before a decision is taken on this.

DISTRIBUTION: Borneo and Philippine Islands

Borneo: *Beccari* 3360, Sungei Unpanang, Pontianak. West Borneo (FI).—*Chew Wee-Lek CWL*. 460, S. Melinau Gorge. Baram Distr., Sarawak, 25 June 1962 (A, E, K, L, SAR & SING).—*Kostermans* 5240, East Kutei, East Borneo, 15 June 1951 (BO & L).—*Puasa* 1396, Sapagaya, Br. N. Borneo, 4 July 1931 (K).—*Purseglove P.* 5357, Tau Range, Sarawak, 4 June 1956 (K, L, SAR & SING).

Philippine Islands: *Britton PNH*. 19715, Isabela, Basilan Island, 28 Oct. 1953 (L & PNH).—*Santos* 4235, Barrio Maloong, Zamboanga, May 1948 (L).—*Sulit PNH*. 10081, Mt. Katanglad, Mindanao, 23 March 1949 (L & PNH).

14. **Poikilospermum peltatum** (Winkl.) Merr. Contr. Arnold Arbor. **8**: 51 (1934).

Conocephalus peltatus Winkl. Bot. Jahrb. **49**: 360 (1913);
Merr. J. Straits Br. Asiat. Soc. **Special**: 229 (1921).

TYPE SPECIMEN: *C. peltatus* Winkl.: *Winkler 2661*, Muara Uja, S.-E. Borneo, 5 May (Lectotype: B; Syntype: B).

Twigs ca. 1 cm. diam.; periderm not splitting, very thick; usually with large lenticels; generally glabrous; stipular- and petiolar-scars fairly prominent; dark grey in dry state. *Lamina* (15-) 20-40 cm. long, (10-) 15-25 cm. broad; very broad cordate; quite coriaceous; sparsely pubescent on abaxial surface; base profound cordate-peltate; apex very round; lateral veins ca. 10 pairs, symmetrically arched; base ca. 7-veined; intercostals numerous, fairly prominent, scarcely straight. *Petioles* (10-) 15-20 (-26) cm. long, 0.2-0.4 cm. broad; periderm not splitting, very thick, sparsely lenticellate; generally glabrous. *Stipules* ca. 5 cm. long; strongly crescentic; well-covered with reddish-stellate hairs, soon glabrous; quite persistent. *Male inflorescences* 6-8 cm. long, 7-9 cm. broad; solitary; branched dichotomously 6-7 times; primary and secondary peduncles about the same length, ca. 2 cm. long; peduncular branches almost glabrous; peduncular bracts paired, very early caducous; floral capitula ca. 0.3 cm. diam., very numerous. *Female inflorescences* ca. 8 cm. long and broad; solitary; branched dichotomously ca. 5 times; primary and secondary peduncles ca. 2 cm. long; all branches glabrous; peduncular bracts paired, very early caducous; floral capitula ca. 1 cm. diam., ca. 32 in each inflorescence. *Male flowers* sessile; ca. 1 mm. long and broad; perianth sparsely pubescent; tepals 4, strongly incurved at the apex; stamens 4, very rarely less, ca. 0.75 mm. long; filaments very short, straight; pistillode ca. 0.7 mm. long, thin and transparent; interfloral bracts absent. *Female flowers* pedicellate; perianth ca. 2 mm. long, 1.5 mm. broad, almost glabrous; 4-lobed; tepals 2 + 2 decussate-imbricate, the inner pair broader than the outer; ovary ca. 1 mm. long, half as broad; stigma ca. 1 mm. long; pedicels usually as long as the perianth; interfloral bracts extremely small. *Achenes* ca. 2 mm. long, ca. 1 mm. broad; apex slightly exserted from the persistent perianth; pedicels not elongating at maturity.

ECOLOGY: No information whatsoever can be found in the herbarium labels with regard to the ecology of this species. Only Winkler noted that it is a "Liana".

VERNACULAR NAME: Lupon (Borneo).

Winkler cited his own collection 2661 as the type. In the Berlin Herbarium, there are two sheets of this number, one containing a very large peltate lamina and noted on the label as having been collected on the 5th May; while the other contains a female inflorescence in a packet and was said to have been collected on July the 5th. Both sheets bear the word "Original" in the author's

handwriting. The discordant dates of the collections were probably mere writing error, and I am willing to regard these two sheets as having come from one plant.

However, in the British Museum in London, there is a specimen also bearing the type number "Winkler 2661" which specimen does not at all agree with those of the Berlin Herbarium. This London specimen, which contains a male inflorescence, actually belongs to the Bornean species *P. cordifolium* described by Bargagli-Petrucci.

A critical study of Winkler's description of this species *peltatum* revealed that Winkler based his description mainly on the Berlin specimens; and since the London specimen does not bear any handwriting of the author, I can conclude that the London specimen has nothing to do with the type collection of this species *P. peltatum*.

It was noted by Winkler that *P. peltatum* is close to *P. cordifolium*. This is not so. The species *P. scabrinervium* is the one closest to *P. peltatum* in the structure of the inflorescences and twigs. This species *P. peltatum* is easily distinguished by its peltate lamina, by the very long and twine-like petioles and by the very thick periderm which seems to resist splitting at practically all stages of growth.

DISTRIBUTION: Borneo.

Borneo: *Endert* 2428, W. Koetai, Central East Borneo, 9 Aug. 1925 (BO, K, L & SING).—*Kostermans* 10591, Central Kutai, G. Kelopok, 23 April 1955 (K & L).—*Winkler* 2661, Muara Uja, S.-O. Borneo, 5 May 1908 (B), excl. spec. in herb. BM.

15. *Poikilospermum scabrinervium* (Barg.-Petr.) Merr. Contr. Arnold Arbor. **8**: 51 (1934).

Conocephalus scabrinervius Barg.-Petr. Nuovo G. Bot. Ital. n. ser. **9**: 223. *t.* 10 (1902); Merr. J. Straits Br. Asiat. Soc. **Special**: 229 (1921).

TYPE SPECIMEN: *C. scabrinervius* Barg.-Petr.: *Beccari* 2938, Mt. Mattang, Sarawak, Dec. 1866 (Holotype: FI).

Twigs 0.5–1.5 cm. diam.; periderm never splitting into flakes or sheets, longitudinally ridged, very rough, with numerous very large lenticels; young parts pubescent, soon glabrous; stipular- and petiolar-scars usually quite prominent; dark brownish in dry state. *Lamina* (15–) 20–40 (–50) cm. long, (6–) 10–20 (–25) cm. broad; obovate, oblong to elliptic; very coriaceous; sparsely pubescent, especially on veins of abaxial surface; base truncate, round to cordate; apex acuminate, rarely acute or obtuse; lateral veins (7–) 10–12 pairs, very rigid and prominent; intercostals numerous, straight, closely set. *Petioles* (6–) 10–22 cm. long, 0.2–0.4 cm. broad; periderm never splitting, ridged longitudinally, rough with numerous large lenticels; lightly pubescent, soon glabrous. *Stipules* 2–5 cm. long; slightly crescentic; lightly to densely pubescent, soon

glabrous; persistent to early caducous. *Male inflorescences* 6–8 cm. long, 7–10 cm. broad; solitary; branched dichotomously 6–8 times; primary peduncles 2–3.5 cm. long, rarely shorter; secondary ones 2–4 cm. long; all branches light pubescent, soon glabrous; peduncular bracts 1–1.5 cm. long, broad foliaceous, paired, usually persistent, very rarely early caducous; floral capitula 0.2–0.7 cm. diam., usually very numerous. *Female inflorescences* (5–) 7–10 cm. long, 6–8 (–11) cm. broad; solitary; branched dichotomously 3–4 times; primary peduncles 1.5–4 cm. long, secondary ones 1–2.5 cm. long; all branches light pubescent; peduncular bracts slightly larger than those of the males, otherwise same; floral capitula 1–1.75 cm. diam., 8–16 in each inflorescence, very rarely less. *Male flowers* sessile; perianth 1–2 mm. long, ca. 1 mm. broad, very sparsely pubescent, soon glabrous; tepals 2, 3 or 4, incurved at the apex; stamens 2, 3 or 4, about the same length as perianth; filaments short, straight; pistillode thin and transparent, slightly shorter than perianth; interfloral bracts almost absent. *Female flowers* pedicellate; perianth 2–3 mm. long, 1–2 mm. broad, usually fairly glabrous, 4-lobed; tepals 2 + 2 decussate-imbricate, strongly incurved at the apex; ovary slightly shorter than perianth; stigma short; pedicels 1–3 mm. long; interfloral bracts absent. *Achenes* 2.5–3.5 mm. long, 1–2 mm. broad; enclosed by persistent perianth; pedicels at most as long as the achenes at fruit.

VERNACULAR NAMES: Gunatol, Lupun and Saringkarang (Borneo).

The very broad ovate lamina of this species can easily be mistaken for those of *P. cordifolium*. As far as the inflorescences are concerned, this species is far removed from *P. cordifolium*. This species is not only close to *P. peltatum* but also to *P. scortechinii* as well.

The male flowers seem to be of two sorts. Those from capitula of 0.4 cm. in diameter or larger, tend to have perianths averaging 2 mm. in length and are often 3– to 4– staminate. On the other hand those flowers from smaller sized capitula tend to have perianth which are rarely longer than 1 mm. and are usually 2-staminate. This character is not used for subdividing the species into two varieties simply because these types of male flowers have very often been found on the same plant!

DISTRIBUTION: Borneo.

Borneo: *Agama A.* 2635, Elopura, Sandakan, 13 Sept. 1949 (K, L & SING).—*Beccari* 2938, Mt. Mattang, Sarawak, Dec. 1866 (FI).—*Boden-Kloss SFN.* 18957, Bettotan, Sandakan, 24 July 1927 (K & SING).—*SFN.* 19075, Bettotan, Sandakan, 7 Aug. 1927 (K & SING).—*Chew Wee-Lek CWL.* 342, Gunong Mulu, Baram District, Sarawak, 13 June 1962 (A, E, L, SAR & SING); *CWL.* 430, S. Melinau Gorge, Baram District, 22 June 1962 (E, L, SAR & SING).—*Clemens* 21393, Kapit, Upper Rejang, Sarawak, 1929

(K & SAR); 21918, Gat, Upper Rejang, Sarawak, 6 July 1929 (K & SAR); 26631, Mt. Kinabalu, Tenompok, North Borneo, 28 Sept. 1931 (G & K); 28762, Mt. Kinabalu, Tenompok, North Borneo, 26 Feb. 1932 (G & K); 29588, Mt. Kinabalu, Tenompok, North Borneo, 7 May 1932 (B, G & K); 29769, Tenompok, North Borneo, 26 May 1932 (B, K & SING).—*Darnton* 357, Kahung, North Borneo, 5 March 1954 (BM).—*Haviland* 3691, Kuching, Sarawak, 9 Jan. 1895 (CGE).—*Haviland & Hose* 3691B, Kuching, Sarawak, 9 Jan. 1895 (BM).—*Kostermans* 4982, East Kutei, East Borneo, 6 June 1951 (BO & L); 9160, Island of Nunukan, N.E. Borneo, 30 Dec. 1953 (K & L).—*Main* 1835, Selimban, 4 Oct. 1949 (BO & L); 2107, Selimban, 11 Oct. 1949 (BO & L).—*Matusop* 7428, Sandakan, N. Borneo, 25 July 1937 (SING).

16. **Poikilospermum scortechinii** (King apud Hooker f.) Merr. Contr. Arnold Arbor. **8**: 51 (1934).

Conocephalus scortechinii King apud Hooker f. Fl. Br. Ind. **5**: 545 (1888); Barg.-Petr. Nuovo G. Bot. Ital. n. ser. **9**: 224 (1902); Ridl. Fl. Mal. Pen. **3**: 357 (1924).

Conocephalus intermedius Barg.-Petr. Nuovo G. Bot. Ital. n. ser. **9**: 218. t. 6 (1902); Merr. J. Straits Br. Asiat. Soc. **Special**: 229 (1921).

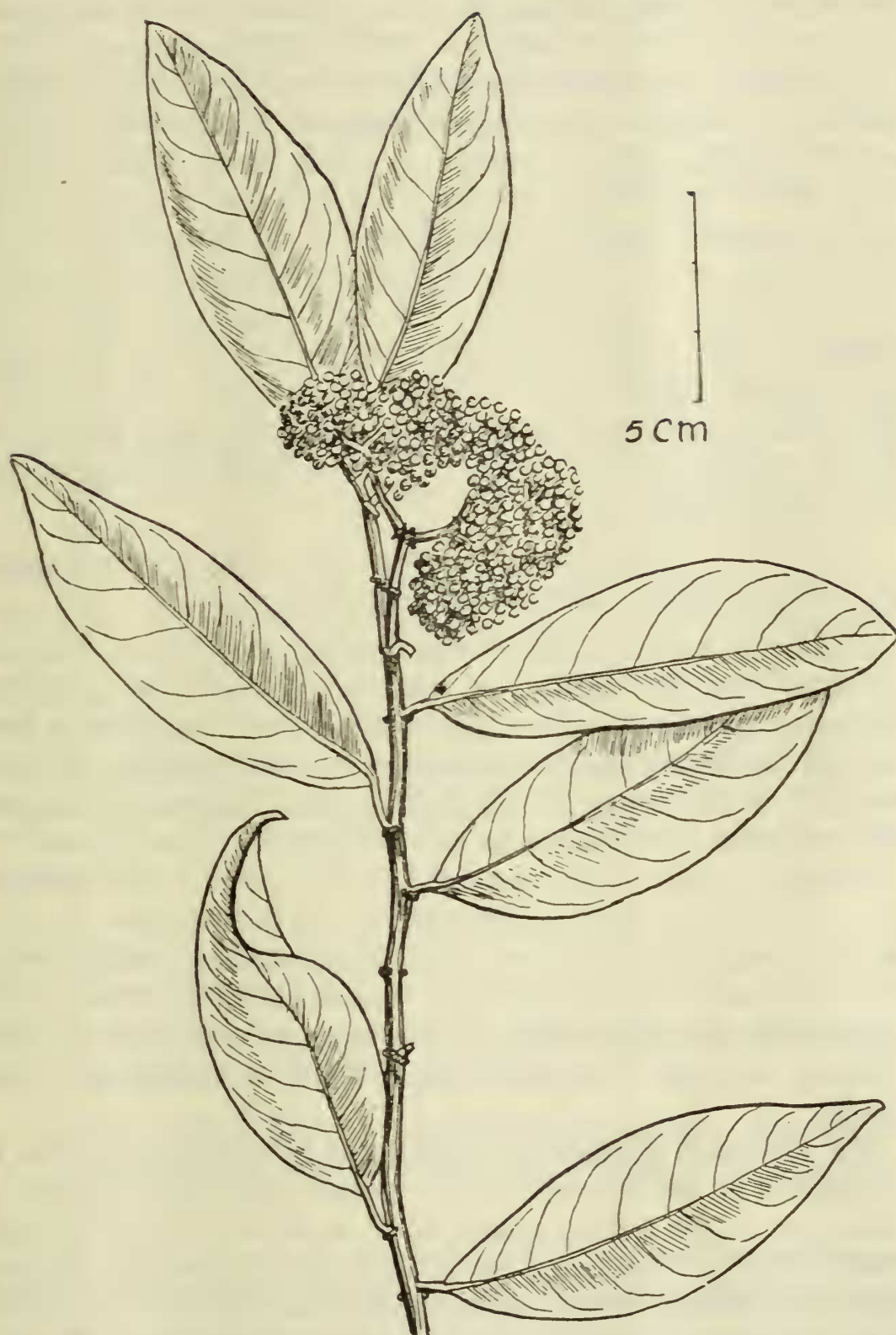
Conocephalus dubius Barg.-Petr. Nuovo G. Bot. Ital. n. ser. **9**: 225. t. 11 (1902); Merr. J. Straits Br. Asiat. Soc. **Special**: 229 (1921).

Poikilospermum dubium (Barg.-Petr.) Merr. Contr. Arnold Arbor. **8**: 49 (1934).

Poikilospermum intermedium (Barg.-Petr.) Merr. l.c. 50.

TYPE SPECIMENS: *C. scortechinii* King apud Hooker f.: *King's Coll.* 7911, Perak, Malaya, July 1885 (Lectotype: SING; syntype: SING).—*C. intermedius* Barg.-Petr.: *Beccari* 3951, Bantin, Sarawak, Borneo, Nov. 1867 (Holotype: FI).—*C. dubius* Barg.-Petr.: *Beccari* 3193, Marop prov., Batan-Lupar, Sarawak, Borneo, April 1867 (Holotype: FI).—**Fig. 22.**

Twigs 0.5–0.7 cm. diam., commonly 0.5 cm.; periderm lightly lenticellate, longitudinally fissured, not splitting into sheets or flakes; glabrous; stipular- and petiolar-scars very prominent; greyish in dry state; often bamboo-like in appearance. *Lamina* (7–) 9–15 (–17) cm. long, (3–) 5–7 cm. broad; elliptic, rarely oblong; quite coriaceous; entirely glabrous; base truncate to round; apex acuminate; lateral veins 7–9 pairs, slightly arched, basal pair often faint; intercostals few, not prominent. *Petioles* (0.75–) 1.75–2.5 cm. long, 0.1–0.2 cm. broad; smooth and glabrous, cystoliths often visible. *Stipules* 0.5–1 cm. long, very early caducous, leaving very prominent scars; young ones very crescentic. *Male inflorescences* 5–12 cm.



JURAIMI DEL.

Fig. 22. *Poikilospermum scortechinii*. Twig with male inflorescence.

wide; solitary; branched dichotomously 6–7 times; primary and secondary peduncles about the same length, 1–3 cm.; branches glabrous; peduncular bracts very early caducous; bract scars very prominent; floral capitula very numerous, each 2–3 mm. diam. *Female inflorescences* about the same dimension as the male; solitary; branched dichotomously 3–4 times; primary peduncles (1.5–) 2–3 cm. long; secondary ones about the same length; all branches glabrous; peduncular bracts early caducous; bract scars very prominent; floral capitula generally 8, rarely more, each 2–3 cm. diam. *Male flowers* sessile; perianth 0.75–1.25 mm. long, 0.5–1 mm. broad; glabrous; tepals 4, sometimes 3 or 2; stamens 4, 3 or 2, slightly shorter than perianth; filaments straight, short; pistillode about the same length as the stamens; interfloral bracts very minute. *Female flowers* pedicellate; perianth 2–3 mm. long, glabrous, 4-lobed; tepals 2 + 2 decussate-imbricate; ovary slightly shorter than perianth; stigma 1–2 mm. long; interfloral bracts very minute. *Achenes* 3–5 mm. long, 1–1.5 mm. broad; enclosed by the persistent perianth.

ECOLOGY: In primary rain forests up to 300 metres; frequent near water courses, swamps and peat swamps.

VERNACULAR NAMES: Ara nasi and Ara Umoo (Malay).

Vegetatively, this species is not very variable, although the Bornean populations tend to have slightly more ovate lamina than those of the Malay Peninsula. Besides, it is very distinct from the others. It is therefore hardly surprising that this species has not been confused with the others of the subgenus *Ligulistigma*.

Bargagli-Petrucci (1902) regarded *P. scortechinii*, *P. intermedium* and *P. dubium* as three distinct species. He distinguished *P. intermedium* from the other two on the basis that its male flowers are 2-staminate. Since 2-staminate flowers have been found intermixed with 4-staminate ones in the same inflorescence of many Malayan materials, this character is therefore considered unimportant.

The species *P. dubium* was considered by him distinct from *P. scortechinii* on the grounds that the female inflorescence is not so divaricate in the former species as it is in the latter; and that glands found in *P. scortechinii* are absent from the other species. Both these differences are again found to be unimportant because of the following reasons: (a) all young inflorescences of *P. scortechinii* are always compact and not divaricate; and the holotype of *P. dubium* certainly had a very young inflorescence; and (b) glands are not always present in *P. scortechinii* either. These three species are therefore here considered conspecific.

DISTRIBUTION: Sumatra, Malay Peninsula and Borneo.

Sumatra: Lorzing 15049 (partim), N.NE. Medan, 21 Jan. 1929 (L).

Malay Peninsula: *Abu* 3040, Sungei Buloh, Selangor, 13 March 1919 (SING).—*Burkill SFN.* 126, Kukob, Johore, 10 Aug. 1913 (SING); *SFN.* 3130, Klang, Selangor, 22 Sept. 1918 (SING); *SFN.* 4107, Klang, Selangor, 4 May 1919 (SING); *SFN.* 6563, Selangor, 18 Sept. 1921 (SING); *SFN.* 7030, Klang, Selangor, 13 March 1921 (SING).—*Corner SFN.* 28484, Jassu Bay, Johore, 11 June 1934 (SING); *SFN.* 30125, Ulu Bendong, Kemaman, 1 Nov. 1935 (SING); *SFN.* 36286, Gunong Panti, Johore, 28 May 1939 (SING).—*Curtis* 2384, Kuala Lumpur, Selangor, Feb. 1890 (SING).—*Fielding s.n.*, Pulau Aor, Johore, 1893 (SING).—*Haniff SFN.* 14326, Telok Anson, Perak, 29 Sept. 1924 (SING).—*Holtum SFN.* 9361, Kluang, Johore, 18 Nov. 1922 (SING).—*King's Coll.* 5845, Gopeng, Perak (FI); 6033, Perak, May 1884 (G); 7911, Perak, July 1885 (SING).—*Ngadiman SFN.* 36700, Pontian, Johore, 3 July 1939 (SING).—*Nur SFN.* 33976, Klang, Selangor, 2 Oct. 1937 (L & SING).—*Ridley* 9193, Johore, April 1898 (SING); 13221, Sungei Tebrau, Johore, 1908 (SING).—*Scortechinii* 144, Perak (FI).—*Teruya* 298, Kota Tinggi, Johore, Dec. 1925 (SING).—*Wray* 1323 and 1339, Tapa, Perak (SING).

Borneo: *Beccari* 3193, Marop prov., del Batan-Lupar, April 1867 (FI); 3951, Bantin, Sarawak, Nov. 1867 (FI); 3968, Sungei Mahon, Kuching, Sarawak (FI).—*Garai* 2458/1964, Kuching, Sarawak, 26 Nov. 1892 (SAR).—*Haviland* 396/345, Sarawak, b.z.e.p. (SAR).—*Haviland & Hose* 3691A, Kuching, Sarawak, 9 Jan. 1895 (SAR).—*Kostermans* 13689, Karangan River, Sankulirang, East Borneo, 3 Sept. 1957 (L).—*Synge S.* 573, Niah, IV Division, Sarawak, Nov. 1932 (K & L).—*Native Collector.* 187, Sarawak (P).

17. *Poikilospermum singalense* (Barg.-Petr.) Merr. Contr. Arnold Arbor. 8: 51 (1934).

Conocephalus singalensis Barg.-Petr. Nuovo G. Bot. Ital. n. ser. 9: 226. t. 12 (1902).

TYPE SPECIMEN: *C. singalensis* Barg.-Petr.: *Beccari s.n.*, Mt. Singalan, Sumatra occid., alto Padang, 1878 (Holotype: FI).

Twigs 0.7–1.5 cm. diam.; periderm splitting into small brown flakes, or rarely not, lightly to very densely lenticellate; young ones well covered with white and red stellate hairs, soon glabrous; stipular- and petiolar-scars scarcely to very prominent; usually brown in dry state. *Lamina* 13–20 cm. long, 5–11 cm. broad; exact ovate to broad elliptic; coriaceous to very coriaceous; young ones with red stellate hairs on veins of abaxial surface, soon glabrous; base cuneate to round; apex obtuse to at most very acute; lateral veins 10–13 pairs, very straight, very prominent; intercostals numerous, closely set, very straight and very prominent. *Petioles* 3–6 cm. long, 0.2–0.3 cm. broad; periderm densely lenticellate or

splitting into small brown flakes; often covered with white hairs intermixed with red ones, soon glabrous. *Stipules* 1–2 cm. long; slightly crescentic; often covered with hairs similar to those of petioles; very early caducous. *Male inflorescences* 6–8 cm. long, 8–12 cm. broad; solitary; branched dichotomously 5–7 times; primary peduncle short, ca. 1 cm. long; secondary peduncles much longer, ca. 2–3 cm. long; all branches densely covered with white hairs intermixed with red stellate ones; bracts very early caducous; floral capitula ca. 0.3 cm. diam., very numerous. *Female inflorescences* ca. 7 cm. long, ca. 8 cm. broad; solitary; branched dichotomously ca. 4 times; primary and secondary peduncles ca. 2.5 cm. long; all branches with red stellate hairs, soon glabrous; peduncular bracts very early caducous; floral capitula ca. 1.2–1.5 cm. diam., about 10 in each inflorescence. *Male flowers* sessile, perianth ca. 1 mm. long and broad; light pubescent at the apex; tepals 4, incurved; stamens 4; filaments short, straight; pistillode small, pale or transparent; interfloral bracts absent. *Female flowers* very shortly pedicellate; perianth ca. 2 mm. long, ca. 1 mm. broad, glabrous, 4-lobed; tepals slightly incurved; ovary slightly shorter than perianth; stigma short, ca. 1 mm. long; pedicel ca. 1 mm. long. *Achenes* unknown.

Bargagli-Petrucci based this species on a female plant collected by Beccari from Mt. Singalan, but he was unable to trace the male ones. After having studied the holotype at Florence (Firenze) very carefully, I therefore equated with confidence the two specimens of male plants to be enumerated below with this species. These specimens had been collected very close to the type locality in West Sumatra.

The same author remarked that this species was similar to *P. lanceolatum* in the sizes of the lamina and petioles, but different in the shapes of lamina and stipules. This species is in fact quite far removed from *P. lanceolatum* in many other respects. As far as I can judge, *P. singalense* seems closest to *P. azureum* which is also from Sumatra.

DISTRIBUTION: Sumatra.

Sumatra: *Alston* 13960, Gunong Labu, 1 March 1954 (BM).—*Beccari* s.n., Mt. Singalan, Sumatra occid., Alto Padang, 1878 (FI).—*Borssum Waalkes* 1703, N.W. of Painan, West Coast Sumatra, 9 June 1957 (L).

18. ***Poikilospermum suaveolens*** (Bl.) Merr. Contr. Arnold Arbor. **8:** 47 (1934), partim; Backer, Bek. Fl. Java **6:** 53 (1948). *Conocephalus suaveolens* Bl. Bijdr. 484 (1825); Benn. in Horsfield, Pl. Jav. rar. 47. t. 12 (1838), exclud. syn. *C. naucleiflorus*: Trec. Ann. Sci. Nat. ser. 3. **8:** 87 (1847); Bl. Mus. Bot. Lugd.-Bat. **2:** t. 39 (1856); Miq. Fl. Ind. Bat. **1** (2): 283 (1859) et Suppl. **1:** 416 (1861) et Ann. Mus. Bot. Lugd.-Bat. **3:** 210 (1867); Kurz, For. Fl. Br. Bur. **2:** 430

- (1877); F.-Villar, Novis. App. Fl. Philipp. Blanco. 203 (1880); Vidal, Sinop. Pl. Filip. Atlas 40. t. 88. f. D (1883); Hk. f. Fl. Br. Ind. **5**: 545 (1888), partim; Barg.-Petr. Nuovo G. Bot. Ital. n. ser. **9**: 218 (1902), partim; Merr. J. Straits Br. Asiat. Soc. **Special**: 229 (1921), partim, et Enum. Philipp. Fl. Pl. **2**: 71 (1923), partim; Ridl. Fl. Mal. Pen. **3**: 357 (1924); Gagnep. in Lecomte, Fl. Gen. Indo-Chine **5**: 831 (1929).
- Procris violacea* Blanco, Fl. Filip. 706 (1837); Merr. Bur. Govt. Lab. **27**: 80 (1905).
- Conocephalus ovatus* Trec. Ann. Sci. Nat. ser. 3. **8**: 89 (1847).
Conocephalus pubescens Trec. l.c. 90.
- Conocephalus ellipticus* Trec. l.c. 91; Barg.-Petr. l.c. 217.
- Conocephalus microphyllus* Trec. l.c. 92; F.-Villar. l.c. 203; Barg.-Petr. l.c. 222.
- Conocephalus blumei* Gaudich. Bot. Voy. Bonite Atlas t. 96 (1847-1848) et apud D'Alleizette, Bot. Voy. Bonite 163 (1866); Barg.-Petr. l.c. 230.
- Conocephalus gratus* Miq. Pl. Jungh. 43 (1851).
- Conocephalus borneensis* Miq. Ann. Mus. Bot. Lugd.-Bat. **3**: 210 (1867); Barg.-Petr. l.c. 219; Merr. J. Straits Br. Asiat. Soc. **Special**: 229 (1921).
- Conocephalus amoenus* King apud Hk. f. l.c. 545; Barg.-Petr. l.c. 220; Ridl. l.c. 357.
- Balansæphytum tonkinense* Drake, Bull. Soc. Bot. France **43**: 83. t. 1 (1896).
- Conocephalus sinensis* Wright in Forbes et Hemsley, J. Linn. Soc. Bot. **26**: 471 (1899).
- Conocephalus violaceus* (Blanco) Merr. Bur. Govt. Lab. **27**: 80 (1905).
- Conocephalus tonkinensis* (Drake) Renner, Bot. Jahrb. **39**: 409 (1907).
- Conocephalus piperi* Elmer, Leaf. Philipp. Bot. **8**: 2770 (1915); Merr. Enum. Philipp. Fl. Pl. **2**: 71 (1923).
- Conocephalus oblanceolatus* Ridl. Kew Bull. 81 (1926).
- Conocephalus mollis* Gagnepain, in Lecomte, l.c. 834 (non Merr. 1921).
- Poikilospermum amoenum* (King apud Hooker f.) Merr. Contr. Arnold Arbor. **8**: 48 (1934).
- Poikilospermum borneense* (Miq.) Merr. l.c. 49.
- Poikilospermum gagnepainii* Merr. l.c. 50.
- Poikilospermum oblanceolatum* (Ridl.) Merr. l.c. 51.
- Poikilospermum piperi* (Elmer) Merr. l.c. 51.

Poikilospermum sinense (Wright) Merr. l.c. 51.

Poikilospermum tonkinense (Drake) Merr. l.c. 52.

Urtica amoena King, nom. nud. in herb.

Urtica superba King, nom. nud. in herb.

TYPE SPECIMENS: *C. suaveolens* Bl.: *Blume s.n.*, Java (Lectotype: L; syntype: B).—*P. violacea* Blanco: Type destroyed; Merr. *Sp. Blancoanæ* 110, Luzon, Philippines, Nov. 1914 (illustrative specimens: B & P).—*C. ovatus* Trec.: *Zollinger* 285, Java (Lectotype: P; syntype: G & K).—*C. pubescens* Trec.: *Leschenault s.n.*, Java (Lectotype: P).—*C. ellipticus* Trec.: *Gaudich. 105*, Pulo Pinang, Malay Peninsula, March 1837 (Holotype: P; isotype: FI & G).—*C. microphyllus* Trec.: *Callery* 54, Manille-Calawan, Philippines (Holotype: P).—*C. blumei* Gaudich.: *Gaudichaud* 144, Manilla, Philippines, Nov. 1836 (Lectotype: P).—*C. gratus* Miq.: Junghun, Djatikalangan, G. Gomping, Java, April (lost?).—*C. borneensis* Miq.: *Korthals*, Banjer-massing, Borneo australis (lost?).—*C. amoenus* King apud Hooker f.: *Porter Wall. cat.* 4626, Penang, Malay Peninsula (Holotype: K).—*B. tonkinense* Drake: *Balansa* 2488, Tonkin, Indo-Chine, April 1888 (Lectotype: P).—*C. sinensis* Wright: *Henry* 11074, Mengtze, Yunnan, China (Holotype: K).—*C. piperi* Elmer: *Elmer* 13653, Agusan, Mindanao, Philippines, Aug. 1912 (Isotypes: B, BM, FI, G & P).—*C. oblanceolatus* Ridl.: *Kloss* 14714, Sipora, Sumatra, 12 Oct. 1924 (Isotype: SING). *C. mollis* Gagnep.: *Poilane* 7328, Annam, Indo-Chine, 24 July 1923 (Lectotype: P).—**Fig. 23.**

Twigs (0.3–) 0.5–1.25 (–1.5) cm. diam.; periderm splitting into transverse copper-brown flakes, flakes extremely profuse to few, prominent to inconspicuous; glabrous to dense white pubescent; stipular- and petiolar-scars fairly prominent; copper-brown in dry state. *Lamina* 10–40 cm. long, 6–25 cm. broad; very variable, broad ovate, ovate, elliptic to obovate; usually very coriaceous; glabrous, rarely pubescent; base cuneate, rounded to profound cordate; apex sharp acute to obtuse; lateral veins (8–) 12–14 (–18) pairs, very straight and prominent; intercostals numerous, straight, rigid and prominent, very rarely faint. *Petioles* (4–) 6–10 (–14) cm. long, 0.3–0.6 cm. diam.; periderm splitting into flakes similar to those of twigs; glabrous to pubescent. *Stipules* (1–) 2–4 cm. long, strongly crescentic; glabrous, rarely pubescent; usually persistent. *Male inflorescences* (2–) 4–6 cm. long, 2–5 cm. broad; solitary; branched dichotomously 2–3 times; primary peduncle as long to twice as long as secondary peduncles; tertiary peduncles numerous, at apex of secondary peduncles, always very short, hence the pseudo-umbellate arrangement of the floral capitula; peduncular bracts paired, usually very large, foliaceous, boat-shaped, persistent,

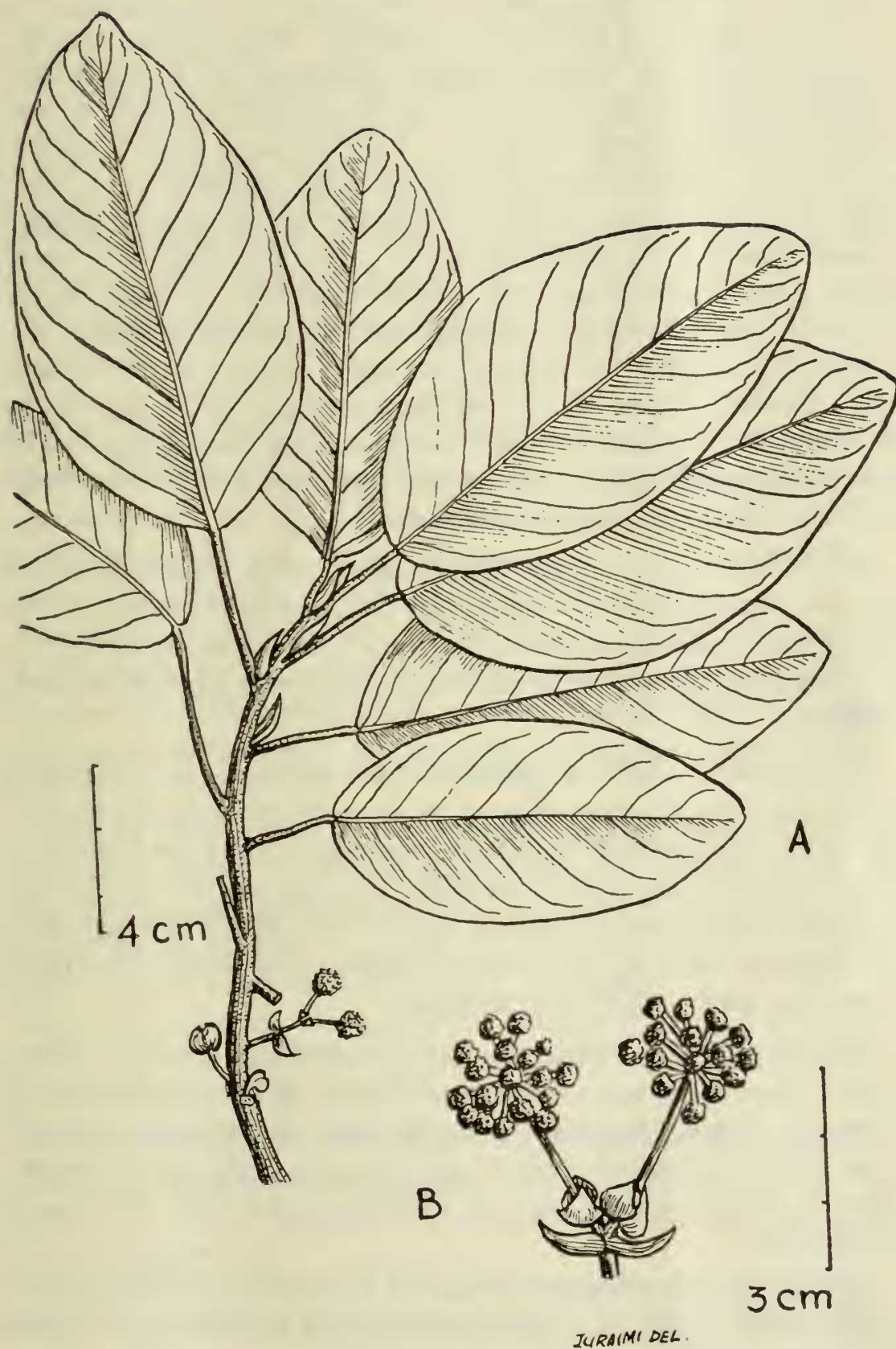


Fig. 23. *Poikilospermum suaveolens*. A, male twig with young inflorescences. B, male inflorescence (matured).

usually 2 pairs at the first dichotomy; floral capitula 0.3–0.5 cm. diam., numerous. *Female inflorescences* 4–6 cm. long, 6–9 cm. broad; solitary; branched once or twice; primary peduncle usually longer than secondary peduncles; peduncular bracts slightly larger than those of the male, otherwise the same; floral capitula 3–5 (–7) cm. diam., 2–4 in each inflorescence. *Male flowers* sessile; 1.5–2 mm. long, as broad; perianth pubescent to rough hairy, rarely glabrous; tepals 4, rarely 2 or 3, strongly incurved at the apex; stamens 4, rarely 2 or 3, ca. 1.5 mm. long, often 2 longer than others; filaments straight, short to long; pistillode ca. 1 mm. long, thin, with capitate stigma; interfloral bracts usually absent. *Female flowers* pedicellate; perianth 2–3.5 mm. long, 1.–2 mm. broad; perianth glabrous, very rarely pubescent; 4-lobed; tepals 2 + 2 decussate-imbricate, the inner part slightly broader than the outer ones, strongly incurved at the apex; ovary 1.–2 mm. long, half as broad; stigma ca. 1 mm. long; pedicels 5–10 mm. long; interfloral bracts usually absent. *Achenes* 3–5 mm. long, 1–1.25 mm. broad; entirely covered by the persistent perianth; pedicels ca. three times the length of achenes.

ECOLOGY: This species occurs more along water courses in the rain forests and seems quite rare in monsoonal forests. It has been found growing from sea-level to as high as 1,500 metres. It does not seem to be able to survive in either very exposed or dark habitats.

ECONOMIC USES: Commercially, this species is not important at all. The bark has often been used as crude ropes by the natives. Cut stems of large sizes have been recorded to yield potable water. Heyne recorded the use of stems for eye diseases in the Celebes. Pounded stems have been used to destroy hair vermin in many parts of Malaysia while in the Malay Peninsula, the leaves and roots have been used variously as medicine.

VERNACULAR NAMES: Akar murah, Ara jankang, Chentawan, Daun Sentawan, Mentawan, Semelit papan, Sentawan and Tentawan (Malay Peninsula). Besto, Kalas, Kekkegoan aroy and Lesa (Java). Gunatol mukul and Gunatong (Borneo). Anopo, Anopol, Hanopol and Panocol (Philippine Islands). Kari waja (Moluccas).

This is the most wide-spread as well as the most variable species of the whole genus. It is small wonder that a long list of names had been applied to it.

The earliest legitimate specific epithet for this species is that of Blume in 1825. Although his description is not diagnostic enough, his specimens are still well preserved in the herbarium of Leiden and Berlin; besides, he published an excellent drawing of it in 1856 which drawing no botanist has yet referred to.

Blanco (1837) described a species from the Philippines, and named it *Procris violacea*; but his specimen is not extant today. This species was equated with Blume's *suaveolens* by F.-Villar in 1880. Merrill in 1905, on the other hand, disagreed with F.-Villar, but was willing to consider it as belonging to the same genus. Hence he recombined it to *Conocephalus violaceus*. However, in 1918, Merrill changed his mind and confirmed F.-Villar's decision, thereby reducing *C. violaceus* to a synonym of this species. I have seen and compared Merrill's illustrative specimen with Blanco's description; and could find no cause whatsoever to disagree with these two botanists. Hence, Blanco's species is here maintained as being conspecific with this species.

Gaudichaud published a drawing of a species between 1847 and 1848 and he named it *C. blumei*. Bargagli-Petrucci in 1902 maintained it as a distinct species and noted erroneously that it was from the Malay Peninsula. I was fortunate to have come across a specimen collected by Gaudichaud from the Philippines, which is probably the one the author made his drawing from. Having found this specimen to be no different from Blume's *suaveolens*, I have to reduce it to a synonym of Blume's species.

Regarding *C. gratus*, it was Miquel who described this in 1851. Then in 1859, he himself reduced it to Blume's *suaveolens*. Since I have not seen the type specimen and since his description is rather general, I therefore prefer not to disagree with Miquel in his later decision.

The type specimen of *C. borneensis* of Miquel is probably lost. However, I realised from his description that the differences he drew between this species and that of Blume is no greater than the differences between a young and an old plant of the same species. Again, I am forced to reduce this species.

On *C. amoenus*, *B. tonkinense*, *C. sinensis*, *C. piperi*, *C. oblanceolatus* and *C. mollis*, I disagree altogether with Merrill. These are conspecific with *P. suaveolens*.

It must be noted here that this species has hitherto been regarded as including Roxburgh's *naucleiflora* from Continental Asia. This research reveals that these two species are quite distinct (see notes on *P. naucleiflorum*).

This species exhibits three vegetative forms. Specimens of populations occurring in the Malay Peninsula and Continental Asia tend to have robust stems and thick coriaceous leaves. The periderm of petioles and twigs usually split into very large and numerous flakes. Specimens from the Philippine populations differ from the Continental ones in having less coriaceous leaves and more lenticels on the twigs; while those from the Javanese populations have less prominent peridermal flakes which may sometimes be invisible

to the unaided eye. However, there are so many intermediates between these forms that it is not possible to divide the species into geographical subspecies.

DISTRIBUTION: India, China, Thailand, Indo-China, Nicobar Islands, Sumatra, Malay Peninsula, Borneo, Philippine Islands, Java, Celebes and Moluccas.

India: *Hooker s.n.*, Mount Khasia, 1861 (G).—*King's Coll. 511*, Chittagong Hill Tracts (G).

China: *Henry 11074*, Mengtze, Yunnan (K).

Thailand: *Gwynne-Vaughan 210*, Koh See Har Island in T.L.S. (CGE).—*Kerr 5707* (BM); *12999*, 22 July 1927 (P).—*Marcan 150 and 816* (BM).—*Pierre 4802*, July 1878 (P).—*Schmidt 646*, 27 Aug. 1901 (C).—*Seidenfaden 2880*, Klong Sabab, 28 Feb. 1935 (SING).

Indo-China: *Balansa 2488*, Tonkin, April 1888 (G & P).—*Bon 2101*, Tonkin, April 1883 (P).—*Chevalier 32409*, N. Annam, 7 Feb. 1914 (P).—*Eberhardt 3119*, Thua Thien (P).—*Petelot 5864*, Tonkin, May 1936 (P).—*Pierre 856*, Cochinchine, April 1867 (P); *1221*, Cambodia (BM); *1558*, Feb. 1874 (G); *1558*, Feb. 1874 (P); *3278*, Cochinchine, May 1877 (P); *3279*, Cochinchine, May 1877 (BM, E & P).—*Poilane 1364*, Lang vay pour de Quang-tri, Annam, 8 April 1920 (E & P); *7328*, Annam, 24 July 1923 (P); *7860*, Annam, 9 Sept. 1923 (P); *10475*, Mai Lauh prov., Annam, 21 May 1924 (P).—*Thorel 1111*, 1862/1866, (G & P); *9166*, Me-Kong, 1866/1868 (P).-

Nicobar Island: *Unknown s.n.*, Galathea Exped. 1845–1847 (C).

Sumatra: *Asdat 169*, Kp. Sigleng, Troeman, Atjeh, 29 Aug. 1941 (BO).—*Batten-Pool s.n.*, Wassenar, Atjeh, 1939 (SING).—*Beccari 793*, Padang prov., Western Sumatra, Aug 1878 (BM & FI).—*Buwalda 6531*, Berapit, 13 April, 1939 (L); *6916*, Indragiri Uplands, 17 July 1939 (L); *7001*, Indragiri Uplands, 24 July 1939 (L).—*Forbes 1577A*, 1881/1882 (BM).—*Huitema 33*, Dempo, Palembang, Dec. 1929 (BO).—*Kloss 14714*, Sipora, 12 Oct. 1924 (SING).—*Koch-Reichenall s.n.*, Sumatra, 1927 (M).—*Krukoff 4458*, Asahan, East Coast, Nov.-Dec. 1932 (BO, BR, G, LE & SING).—*Lorzing 12177*, Sibolangit, 17 Oct. 1927 (L).—*Nur SFN. 7387*, Da-to Pulau Siam, 6 Aug. 1921 (SING).—*Teysmann 7299*, Bangka (C).

Malay Peninsula: *Ahmad 5184*, Kuala Lumpur, Selangor, 20 Dec. 1919 (SING).—*Alvins s.n.*, Malacca (SING).—*Burkill SFN. 124*, Kukob, Johore, 10 Aug. 1913 (SING).—*Burkill & Haniff SFN. 12441*, Grik, Perak, 18 June 1924 (SING).—*Chew Wee-Lek CWL. 7*, Bukit Timah, Singapore, 12 Jan. 1957 (CGE & SING); *CWL. 16*, same loc., 25 Jan. 1957 (SING); *CWL. 24 & 25*, Mandai

Road, Singapore, 20 Feb. 1957 (SING); *CWL*. 27, Rifle Range, Nee Soon, Singapore, 21 Feb. 1957 (SING); *CWL*. 32, 47th mile, Ulu Sedili, Johore, 26 Feb. 1957 (SING); *CWL*. 34, Nee Soon Reservoir, Singapore, 5 March 1957 (SING); *CWL*. 57, 31st mile, Jalan Kelantan, Trengganu, 28 March 1957 (CGE, L & SING); *CWL*. 61, 78 & 79, Jerangau F.R., Trengganu, 30 March 1957 (SING); *CWL*. 124 & 126, Baling, Kedah, 9 April 1957 (SING); *CWL*. 195, Bt. Kalong, Kodiang, Kedah, 21 May 1957 (CGE & SING); *CWL*. 210, Bt. Hantu, Kodiang, Kedah, 23 May 1957 (CGE & SING).—*Chew Wee-Lek & Kiah CWL*. 97, Kuala Krai, Kelantan, 2 April 1957 (CGE & SING).—*Clemens* 22500, Botanic Gardens, Singapore, 12 May 1929 (P).—*Corner SFN*. 28506, Sungei Rau Reba, Johore, 12 June 1934 (SING).—*Curtis* 1745, Rest Hill, Penang, March 1892 (SING); 2681, Langkawi, Kedah, Sept. 1890 (SING).—*Derry* 1219, *Malaka Omdah*, Malacca, June 1892 (BM & SING).—*Gaudichaud* 105, Pulo-Pinang, March 1837 (FI, G & P).—*Henderson SFN*. 22584, Gua Tipus, Pahang, 10 Aug. 1929 (SING).—*King's Coll.* 704, Gopeng, Perak (FI); 4066, Perak, March 1883 (BM & G).—*Ridley* 1152, Pahang, 4 May 1890 (SING).—*Salvit s.n.*, Penara Bukit, Penang, (SING).—*Spare SFN*. 36020, Sungei Krian Estate, Perak, 12 July 1938 (SING).—*Vesterdal* 286, Johore (C).—*Wray* 549, River Plus, Perak (SING).—*Yakim* 7412, Kuala Lumpur, Selangor, 14 June (SING).

Borneo: *Alston* 13244, Permatang, Indonesian Borneo, 25 Jan. 1954 (BM).—*Anderson* 8566, Saribas, Betong, Sarawak, 14 Aug. 1957 (L & SAR).—*Beccari* 320 & 757, Kuching, Sarawak (FI).—*Brooke* 8792, Kelepu, Sarawak, 11 July 1954 (L).—*Buwalda* 7982, Sampit bloekar, 8 Oct. 1940 (BO & L).—*Elmer* 20236, Sandakan, N. Borneo, 1921 (BM, C, G, M, P & SING); 20703, Tawao, N. Borneo 1923 (C, G, L, M, P & SING).—*Gibbs* 2722, (BM).—*Kostermans* 4486, Balikpapan, 2 Sept. 1950 (BO & L).—*Purseglove* P. 5046, Bako National Park, Sarawak, 20 May 1956 (L, SAR & SING).—*van Steenis* 1243, G. Ranai Exped. to Anambas & Natoena Islands, 1928 (SING).—*Wood San.* A4630, Kinabatangan, N. Borneo, 22 July 1954 (A, L, MEL, SING & KEP).

Philippine Islands: *Adduru* 219 & 275, Cagayan, Luzon, May-June 1917 (P).—*Alcasid & Celestino PNH*. 7307, Tawitawi, June 1940 (PNH).—*Borden* 1186, Bataan, Luzon, June 1904 (BM).—*Britton PNH*. 19469, Calapan, Mindoro, 22 April 1953 (L & PNH).—*Callery* 54, Manille (P).—*Conklin PNH*. 17403, Mt. Yagaw, Mansalay, 17 Feb. 1953 (PNH).—*Cuming* 600, 1841 (BM & FI).—*Edano PNH*. 1299, Davao, Mindanao, 9 Oct. 1946 (PNH).—*Edano & Gutierrez PNH*. 37720, Irosin, Sorsogon, Luzon, 11 May 1957 (L).—*Elmer* 7469, Tayabas, Luzon, May 1906 (E, FI & G); 13653, Agusan, Mindanao, Aug. 1912 (BM, B, FI, G & P).—

Fenix 15871, Davao, Mindanao, Aug. 1912 (SING).—*Fox* PNH. 5053, Baler, Quezon, Luzon, March 1948 (PNH).—*Gaudichaud* 144, Manille, Nov 1836 (G & P).—*Hallier* 4442, Basilan, 18 Jan. 1904 (L); 4528, Basilan, 24 Jan. 1904 (L).—*Mendoza* PNH. 18556, Albay, Luzon, 18 June 1953 (PNH).—*Merrill*, *Spec. Blanco* 110, Luzon, Nov. 1914 (B & P); *Spec. Blanco* 111, Luzon, Nov. 1914 (P).—*Pancho* PNH. 33265, Davao, Mindanao, 1 May 1955 (PNH).—*Quisumbing* PNH. 2519, Baler, Quezon, Luzon, 7 May 1947 (PNH).—*Ramos & Edano* 45233, Tayabbas, Luzon, May 1925 (B & P).—*Ramos & Pascasio* 34434, Surigao, Mindanao, April 1919 (K).—*Sinclair & Edano* 9676, Bulusan, Sorsogon, Luzon, 21 June 1958 (L & SING).—*Sulit* PNH. 3639, Mt. Bulusan, Sorsogon, Luzon, 30 July 1947 (BR & PNH).—*Vidal* 924, Isole, April 1887 (FI).—*Wenzel* 337, Leyte (G); 417, Leyte (G); 3052, Surigao, 2 July 1927 (G & M).—*Whitford* 13, Bataan, Luzon, April 1904 (P); 770, Tayabas, Luzon, Sept. 1904 (P).

Java: *Banks & Solander* s.n., 1770–1771 (BM).—*Blume* s.n., Java, 1836 (P); s.n., Java (B & L).—*Bruggeman* 38, Tjibodas, Preanger, 29 March 1924 (BO).—*Commerson* s.n., (P).—*Durand* 6649, 13 Aug. 1907 (L).—*Forbes* 387, West Java (BM & LE); 485, West Java, 1879/1880 (BM).—*Franck* 219, East Java (C); 688, East Java, Dec. 1923 (C).—*La-Haye* s.n., Java (P).—*Horsfield* 524, Mallang (BM).—*Lanjouw* 44, Java (BO).—*Leschenault* s.n., (P).—*Martens* s.n., (BR).—*de Monchy* s.n., Java (P).—*Teysmann* s.n., 1868 (B & P).—*de Vriese* s.n. (BR).—*Zollinger* 285, (G, K, LE & P); 329, (FI); 543, (B, FI, G & P); s.n., (G). *Unknown (Junghuhn?)* s.n., (P).

Celebes: *Alston* 16174, Tomohon (BM).—*Beccari* s.n., Penisola S.E. Kandari, 1874 (FI).—*Bloembergen* 4198, Paloe, Menado, 12 July 1939 (BO & L).—*Elbert* 3373, S.-Celebes, 26 Oct. 1909 (L).—*Eyma* 1156, Mesamba, 19 July 1937 (BO & L).—*Kjellberg* 696, Kendari, Poehara, 6 March 1929 (S); 876, Wavotobi (S); 1629, Rante Lemb, 9 June 1929 (S).—*Riedel* s.n., Minado, 1874 (M).

Moluccas: *Anang (exp. de Haan)* 629, Weda, S. Peninsula, Halmaheira, May 1938 (BO).—*Lam* 3620, Sangi and Talaud Isle. Morotai, 26 June 1926 (BO & L).—*Nedi* 155, Amasing, 12 Sept. 1937 (L); 207, Sosoepoe, Kp. Taroeba, 1 Oct. 1937 (L); 363, Djikodjiko Lebengor, Halmaheira, 13 Oct. 1937 (BO).

19. *Poikilospermum subtrinervium* (Miq.) Chew, **comb. nov.**

Conocephalus subtrinervius Miq. Fl. Ind. Bat. **Suppl.** 417 (1861), basionym.

TYPE SPECIMEN: *C. subtrinervius* Miq.: *Junghuhn*, Sumatra bor.

Twigs 0.3–0.75 cm. diam., rarely thicker; periderm splitting into copper-brown flakes; generally glabrous; stipular- and petiolar-scars scarcely to distinctly prominent. *Lamina* 8–14 cm. long, 2–6 cm. broad; elliptic to ovate; glabrous; quite coriaceous; base cuneate to broad cuneate, rarely round; apex sharp or blunt acute to long acuminate; lateral veins fairly straight, very prominent, 7–10 pairs, rarely less, the basal pair usually prominent; intercostals numerous, usually faint. *Petioles* 1–3.5 cm. long, ca. 0.2–0.4 cm. broad; periderm splitting into small brown flakes; light pubescent, soon glabrous. *Stipules* very small, early caducous. *Male inflorescences* 2–4 cm. long and broad; solitary; branched dichotomously 2–3 times; secondary peduncles slightly longer than primary one; tertiary peduncles numerous, very short, at the apex of secondary peduncles, hence the pseudo-umbellate arrangement of the floral capitula; peduncular bracts paired, very small, often early caducous; floral capitula 2–3 mm. diam., very numerous. *Female inflorescences* ca. 6 cm. long, ca. 8 cm. broad; solitary; branched twice; primary peduncle ca. 1.5 cm. long, secondary ones ca. 4.5 cm. long; branches light pubescent, soon glabrous; peduncular bracts paired, ca. 1 cm. long, early caducous; floral capitula ca. 2 cm. diam., usually 4 in each inflorescence. *Male flowers* sessile; ca. 1 mm. long and broad; perianth pubescent to glabrous; tepals 4, slightly gamophyllous at the base, rarely 2 or 3, strongly incurved at the apex; stamens 4, rarely 2 or 3, ca. 1 mm. long; filaments straight, short; pistillode ca. 1 mm. long, thin; interfloral bracts absent. *Female flowers* pedicellate; perianth ca. 2 mm. long, light pubescent, soon glabrous, 4-lobed; tepals 2 + 2 decussate-imbriate; ovary ca. 1 mm. long; stigma 1–1.5 mm. long; pedicel 3–5 mm. long; interfloral bracts absent. *Achenes* ca. 3 mm. long, ca. 1.5 mm. broad; apex slightly exerted from the persistent perianth.

It has already been remarked earlier that Hooker misinterpreted this species in 1888 by equating with it numerous collections of the species *P. microstachys*.

Merrill in 1934, considered this species conspecific with Trecul's *P. lanceolatum*. It has now been found that Merrill was in error and that this species *P. subtrinervium* is in fact distinct.

Although the type specimen has not been examined, the description that Miquel supplied for this species is detailed enough for me to identify the specimens cited below. These are the only Sumatran materials that answer the description.

DISTRIBUTION: Sumatra.

Coert 1634, Banka, 25 Sept. 1941 (L).—*Posthumus* 667, Djambi, 4 Aug. 1925 (SING).—*Robinson & Kloss* 210, Korinchi, 16 April 1914 (BM).—*Rutten-Kooistra* 22, Palembang, Dec. 1938 (BO).—*Yates* 1086, East Coast (BM); 1413, East Coast (P).

20. *Poikilospermum tangaum* Chew, spec. nov.

TYPE SPECIMEN: *Elmer 20724*, Tawao, Elphinstone Prov., North Borneo, Oct. 1922/March 1923 (Holotypus: SING; isotypus: BM, BR, C, G, M & P).—Fig. 24.

Ramuli (0.3–) 0.5–1 cm. diam., glabri, novelli cortice levi, mox fisso in scidis, cicatricibus stipularum et petiolarum paullum elevatis. *Laminae* (10–) 11–13 cm. longae, (3–) 4–5 (–6) cm. latae, ellipticae vel oblongae, chartaceae vel coriaceae, glabrae, basi cuneatae, raro rotundatae, apice acuminatae, acumine brevi obtuso; costis lateralibus utrinsecus 7–9, subtus aliquanto elevatis; intercostis obscuris. *Petioli* 2–7 cm. longi, ca. 0.1 cm. lati, cortice levi glabri. *Stipulae* 1–2 cm. longae, gracillimae, lunatae, glabrae, caducae. *Inflorescentiae masc.* 2–3 cm. longae et latae, solitariae; pedunculo pluries dichotomo, pedunculo primario et secundario ca. 0.5–1 cm. longo, aliis brevissimis; paullum pubescentes, mox glabrae; bracteis geminatis ca. 0.5–1 cm. longis, caducis; capitulis 0.3–0.5 cm. diam., numerosis, in capita duo, ca. 1–2 cm. diam. globosa coacervatis, utraque ad pedunculum secundarium. *Inflorescentiae fem.* (4–) 6–9 cm. longae, (4–) 6–8 (–12) cm. latae, solitariae; pedunculo pluries dichotomo; pedunculo primario 1–2.5 cm. longo, secundariis 2–3.5 cm. longis; glabrae, raro paullum pubescentes; bracteis geminatis, ca. 1 cm. longis, caducis; capitulis ca. 1 cm. diam., octo vel pluribus. *Flores masc.* sessiles, ca. 1 mm. longi et lati, paullum vel dense pubescentes; tepalis 2; staminibus 2, filamentis erectis brevibus; pistillodio minuto, interdum absenti. *Flores fem.* subsessiles, vel breve pedicellati; perianthio ca. 2 mm. longo, 1–2 mm. lato, 4-partito; tepalis glabris, apice incurvo; ovario ca. 1.5 mm. longo, ca. 1 mm. lato; stigmatibus brevi; pedicello ca. 1 mm. longo. *Achaenia* ca. 3 mm. longa, ca. 1.5 mm. lata; piriforma, apice e perianthio persistenti paullum exserto; pedicello ca. 1.5 mm. longo.

ECOLOGY: This species occurs from sea-level to 1,500 metres in altitude in North Borneo and seems to prefer wet habitats.

VERNACULAR NAME: Tangau (Borneo).

Most of the collections of this species had been wrongly identified by Merrill as *micranthum* of Miquel. I have compared these specimens with Miquel's description of *micranthum* very carefully, and found that Miquel was referring to a different species because of the following facts:—

- (a) The male inflorescences of this species are very congested and not wide-spread, whereas Miquel's species have very divaricate inflorescences.

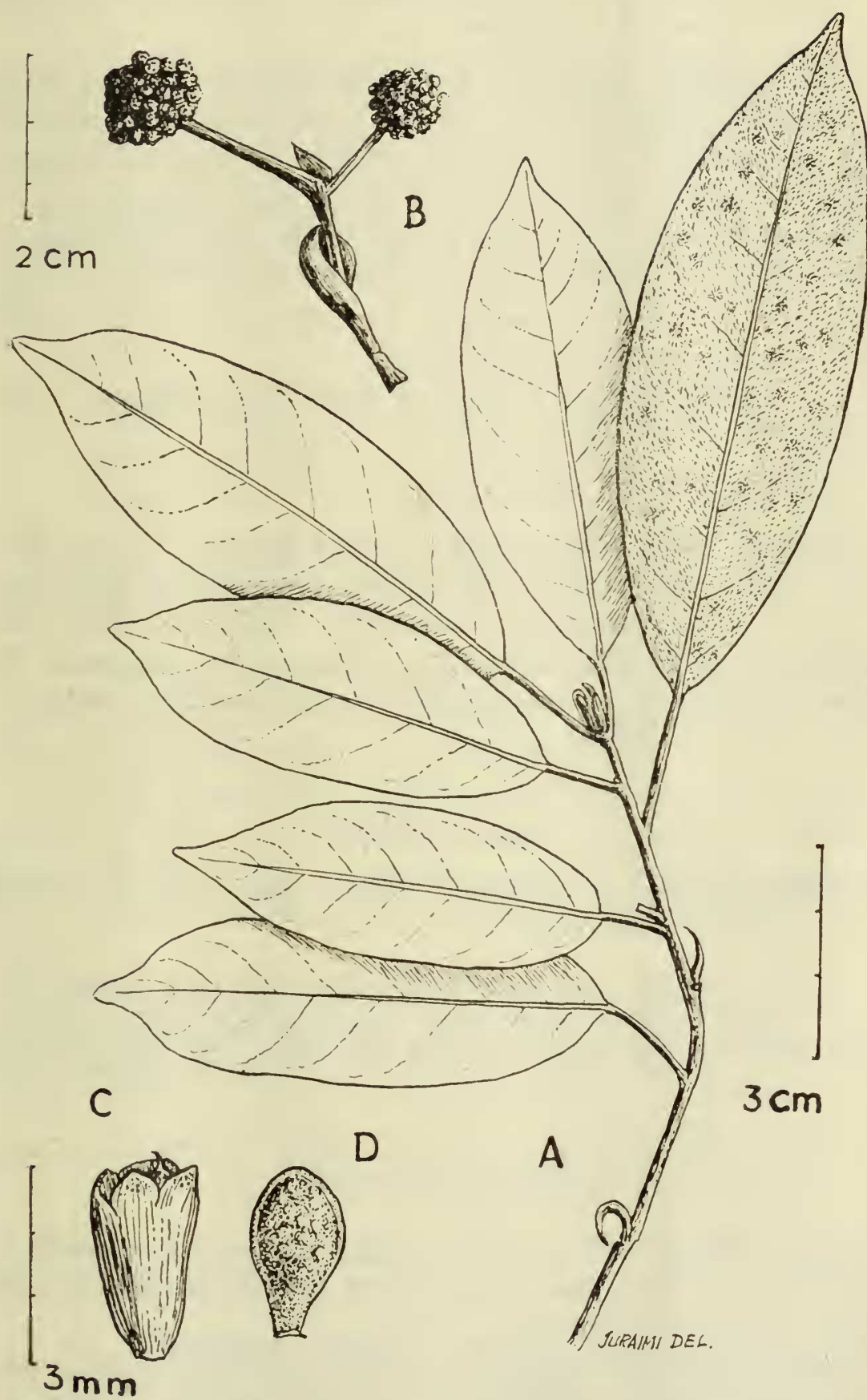


Fig. 24. *Poikilospermum tangaum*. A, twig. B, female inflorescence (part). C, female flower. D, achene.

- (b) Miquel observed that his plants are trees reaching 30 feet in height, whereas plants of *P. tangaum* are fairly frail scramblers.
- (c) The lamina of his plants seem to be much broader than those of *P. tangaum*.

This species *P. tangaum* is easily distinguished from the others of subgenus *Ligulistigma* by (a) the broad pear-shaped achenes, (b) the occasional absence of the pistillode from the male flowers and (c) the very congested nature of the male inflorescences.

It is of interest to note that plants of this species that occur in the lowlands have thin, almost chartaceous lamina, whereas those that occur on the hills or highlands above the 1,000 metres contour tend to have more coriaceous lamina.

The specific epithet is derived from the vernacular name "tangau".

DISTRIBUTION: North Borneo.

Clemens 26232, Dallas 3,000 ft., Mt. Kinabalu, 17 Aug. 1931 (K); 29769, Tenompok, 5,000 ft., Mt. Kinabalu, 26 May 1932 (G, K & M).—*Elmer* 20724, Tawao, Oct. 1922/March 1923 (BM, BR, C, G, M, P & SING).—*Puasa-Angian* 4074, Tambunan, 15 Feb. 1934 (SING).—*Wood San.* 15038, near Sandakan, 31 March 1955 (K, L & SING).

Species Dubiae

1. ***Poikilospermum micranthum*** (Miq.) Merr. Contr. Arnold Arb. 8: 50 (1934).

Conocephalus ? micranthus Miq. Ann. Mus. Bot. Ludge.-Bat. 3: 210 (1867); Barg.-Petr. Nuovo G. Bot. Ital. n. ser. 9: 217 (1902); Merr. J. Straits Br. Asiat. Soc. **Special:** 229 (1921).

TYPE SPECIMEN: *C. micranthus* Miq.: *Korthals s.n.*, Mantat, South Borneo (type lost?).

Miquel himself was not sure whether this species belonged to *Conocephalus*. He added, however, that its habit is rather similar to that of *Poikilospermum*.

This species was recognised by Bargagli-Petrucci in 1902; and was noted by him as a distinct one because of its tree habit. As he had neither seen the type specimen nor equated any collection with it, his remark is here not taken seriously. What he actually did, amounts to a re-description of Miquel's species in slightly different words.

In 1921, Merrill also recognised this species. Again like Bargagli-Petrucci, he made no attempt to interpret it. Then sometime in the 1930's Merrill equated a few collections from North Borneo with it.

It has now been found that what Merrill had were specimens of an undescribed Bornean species distinct from *micranthum*.

In the course of this work, I have not yet come across any specimen that could answer the description Miquel supplied for this species; and since I have not been able to trace the type specimen, I prefer to leave it as a doubtful species as Miquel had done himself.

2. *Conocephalus concolor* Dalz. in Dalz. et Gibbs. Bomb. Fl. 239 (1861); Hooker f. Fl. Br. Ind. 5: 546 (1888); Barg.-Petr. Nuovo G. Bot. Ital. n. ser. 9: 230 (1902); Cooke, Fl. Bomb. 2: 660 (1907).

The following description was given by Dalzell for this species which was not typified at all:—

“Shrubby; leaves very large (1 foot), irregularly scattered, 3-nerved, perfectly smooth, oblong-ovate, acute, green on both sides; female flower axillary. At Phoonda Ghant.”

It is small wonder that most botanists regarded this a doubtful species. Cooke in 1907 had this to say: “The above is Dalzell's description of the plant, which has not as yet been found by any other collector, and there are no specimens anywhere so far as I know.”

Merrill, in 1934, for some reason or other, did not transfer it to *Poikilospermum*. Since this species could mean practically anything, I prefer to leave it as another doubtful one

Species Excludenda

Conocephalus niveus Wight, Ic. 6: 7. t. 1959 (1853); Dalz. et Gibbs. Bomb. Fl. 239 (1861).

! = **Debregeasia velutina** Gaudich. Voy. Bonite, Atlas, t. 90 (1847–1848). [= *D. longifolia* (Nic. Burm.) Wedd. (1869).]

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